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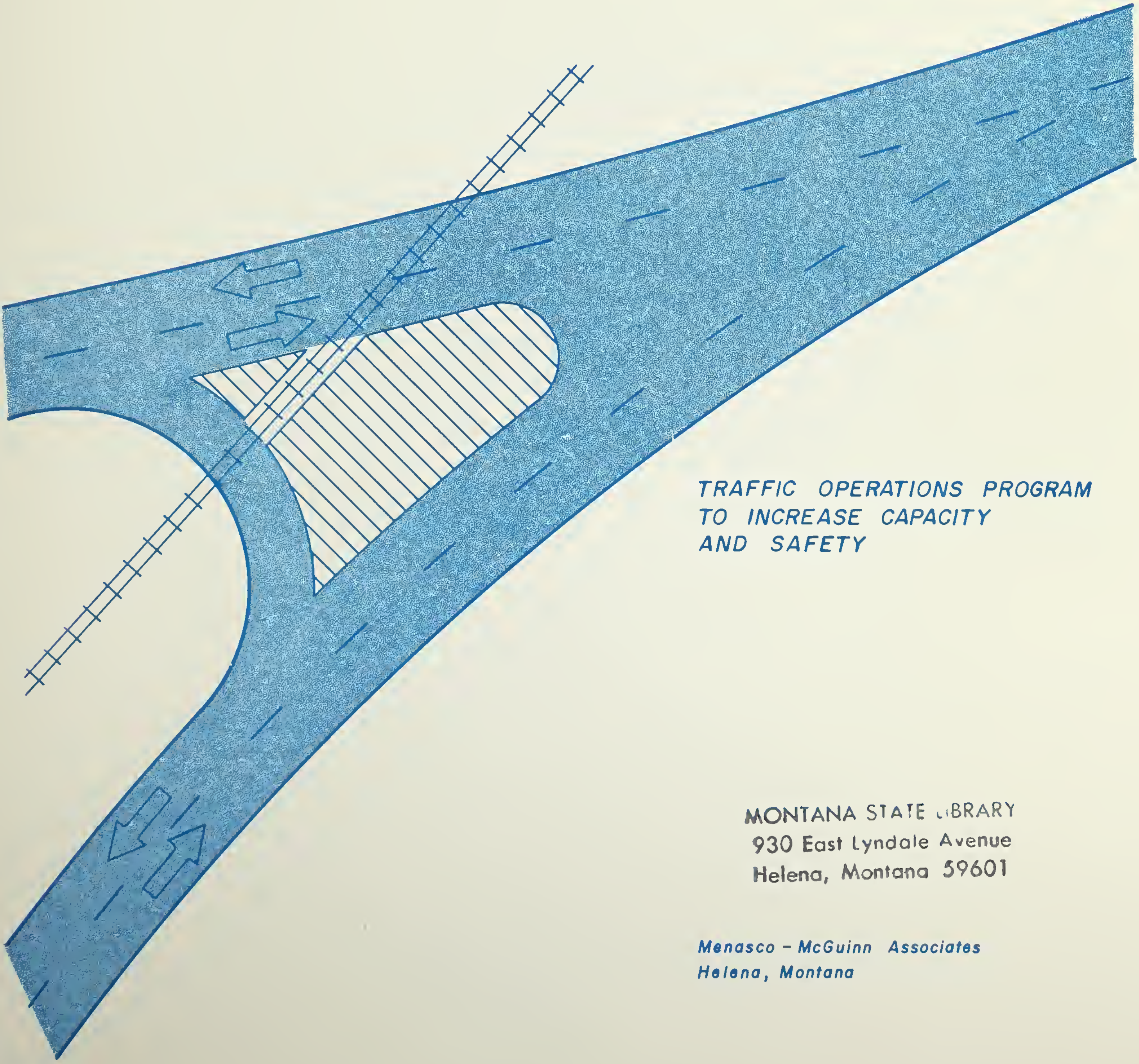

TRAFFIC OPERATIONS PROGRAM TO INCREASE CAPACITY AND SAFETY

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CITY OF LIVINGSTON

TOPICS STUDY

TRAFFIC OPERATIONS PROGRAM TO INCREASE CAPACITY AND SAFETY

For the
Planning and Research Bureau
Montana Department of Highways

In cooperation with the
Department of Transportation
Federal Highway Administration

By
Menasco-McGuinn Associates

October 1973

The opinions, findings, and conclusions expressed in this publication are those of the authors, and not necessarily those of the Federal Highway Administration.

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CHAPTER I – INTRODUCTION AND BACKGROUND

A. INTRODUCTION

This report presents the findings of a Traffic Operations Program to Increase Capacity and Safety (TOPICS) Study in the Livingston urban area. TOPICS programs are intended to maximize the utilization of existing street networks by applying traffic engineering techniques and analyses. The scope of the TOPICS program limits projects to miscellaneous kinds of work normally considered minor items as compared to regular urban highway construction projects. These projects consist of channelization of traffic flow, minor widening of traffic lanes, pavement markings, installation of traffic control systems, short construction projects to eliminate bottlenecks, installation of one-way couplets, and similar types of projects.

TOPICS projects have the characteristic of being low-capital investment projects. However, by properly using traffic engineering principals, these low-capital improvements can have a large beneficial effect on the efficiency and safety of traffic flow.

B. STUDY AREA

The study area is the federal aid urban area of Livingston as established by the State Department of Highways and approved by the Federal Highway Administration. Livingston is located in the western portion of the Yellowstone Valley which is one of the state's most scenic areas. Livingston lies 53 miles north of the Gardiner entrance to Yellowstone National Park and tourism is an important factor in the economics of the city, along with agriculture and the railroad. Livingston is surrounded by various mountain ranges and is near many fine rivers and streams. This high quality environment makes Livingston an attractive place to live.

C. SCOPE OF STUDY

The intent of this study is to establish a network of the most important streets in Livingston and to maximize traffic flow on these streets with minor construction projects that are determined by traffic engineering analyses.

This study used existing information to the extent possible, collected additional data where needed, and solicited the involvement of and approval by local officials. The final result was a proposed street network and a schedule of proposed improvements designed to increase the capacity and improve the safety of traffic flow in Livingston.

D. EXISTING TRANSPORTATION SYSTEMS

Livingston has substantial transportation facilities compared to many other communities of its

size. Interstate Route 90 coming east from the Idaho border passes through Missoula, Butte, Bozeman, Livingston, and Billings, connecting it to four of the five largest cities in the state. Livingston is also served by U. S. Routes 89 and 10.

Amtrak serves Livingston on the east-west experimental route for four days a week: Tuesday, Thursday, Saturday, and Sunday.

Livingston is 37 miles from the air carrier airport of Gallatin Field which is under the jurisdiction of Bozeman. The air carriers of Western, Northwest-Orient, and Frontier serve this airport.

Livingston is also served by the inter-city Greyhound Bus Company. Daily bus runs are made to Great Falls, Butte, Billings, and West Yellowstone.

There is no public transit system within the Livingston urban area.

E. POPULATION

The growth in population over the years in Park County, Livingston, and the state is graphically depicted in Figure No. 3.

Livingston, the major urban center of the county, showed steady growth in population up to 1960 at a rate approximating that of the state. While the most rapid period of growth occurred between 1900 and 1910, Livingston gradually increased its share of the total county population each decade to 1950. Since then, Livingston's share has declined, due not to a decrease in the rate of urbanization in the total county, but rather to an increase in suburban residential growth outside and adjacent to the city.

Until quite recently, Livingston has shown uninterrupted growth. However, due to employment losses since 1960, the population is estimated to have declined from a total of 8,200 in 1960 to 6,883 in 1970.

F. FUNCTIONAL CLASSIFICATION

As part of a national study, the Montana Department of Highways with cooperation from the cities has classified major streets in each urban area according to their use or function. The functional classification process was done in accordance with Federal Highway Administration criteria applied on a national scale. Highways were classified into categories as follows:

(1) **Principal Arterials**

Those streets which serve the major centers of activity, carry the highest traffic volumes, have the longest trip lengths, and carry a high proportion of the urban area travel on a minimum of mileage. This is a continuous system which provides continuity to rural arterials.

(2) **Minor Arterials**

These streets interconnect with and augment the urban principal arterial system, and pro-

vides service to trips of moderate length at a somewhat lower level of travel mobility than principal arterials. This system distributes travel to geographic areas but ideally does not penetrate identifiable neighborhoods.

(3) Collectors

Collectors provide for both land access and local traffic movements within residential neighborhoods, commercial areas, or industrial areas. This system collects traffic from local streets and channels it to the arterial systems.

The Functional Classification System as projected to 1990 for the Livingston urban area is shown in Figure No. 2, and was used as a guide in arriving at the tentative TOPICS network.

G. EXISTING TRAFFIC STUDIES

There have been no recent traffic studies completed in Livingston in which a formal report was available for review.

CHAPTER II – PRELIMINARY STUDIES

A. TOPICS NETWORK

The study procedure was to first review all existing data on the street systems and to establish a tentative TOPICS network. The network consists of urban extensions of the Federal Aid Primary System (called *Primary Type I*), urban extensions of the Federal Aid Secondary System (called *Secondary*), and streets not on any federal aid system which are selected according to Federal Highway Administration criteria to be on the TOPICS system (called *Primary Type II*). This Primary Type II constitutes the TOPICS system.

The system was approved by the Department of Highways and the Federal Highway Administration on August 31, 1972.

The TOPICS network has been approved by the Livingston City Council, the Montana Department of Highways, and the Federal Highway Administration. The established network can therefore be considered as Livingston's final TOPICS network.

Following are the route mileages for each federal aid and TOPICS system.

System	Miles
Primary Type I (Federal Aid)	2.53
Secondary (Federal Aid)	0.00
Primary Type II (TOPICS)	9.41
Total	11.94

The final TOPICS network is shown in Figure No. 1.

B. IDENTIFICATION OF PROBLEM AREAS

After establishing the tentative TOPICS network, the next step was to locate the problem areas on this network. This was done by driving the network and simply observing and recording the areas of apparent congestion and danger. The observation team then located themselves at these locations during morning (7-9) and evening (4-6) peak traffic periods and made preliminary traffic counts and observed more closely the types of movements being made by drivers. If in their opinion, the location was still considered to be a problem area, the team took preliminary measurements and noted such items as condition of pavement, condition of curb if any, and traffic signs or signals.

After identifying all of the problem areas that the team truly believed to be problems, City officials were contacted for their knowledge of problem areas. This was done for the obvious reason that local people who drive the streets every day have a great deal of knowledge of the operation of the network. Some additional problem areas were added to the preliminary list.

After this preliminary list was compiled, two additional checks were made. The first was a pre-

liminary investigation into the accident reports for the current year. Particular attention was devoted to finding high accident locations that were not defined previously as problem areas. The problem areas were assigned their number of accidents for that year. The second check was to compare the TOPICS network against the problem areas to insure that they were all contained within the TOPICS network. With additional review with City personnel, this then became the list of preliminary problem areas.

Finalization of the preliminary problem area list consisted of drafting diagrams of each problem area and adding what existing information was available to the diagram.

Ten preliminary problem areas were identified and diagramed. These ten preliminary problem area diagrams are available in the preliminary report to indicate their location as well as the information collected at the time. Of the ten preliminary problem areas identified, seven were in the central business district (CBD). This indicated that the CBD area was a system problem as opposed to seven individual problem areas.

The other isolated problem areas were:

Junction of U. S. 10, U. S. 89 and Park Street
5th Street and Park Street
Railroad Crossings, 5th Street and B Street

C. PRELIMINARY REPORT

A preliminary report was prepared in November of 1972 and was submitted to the City. A meeting was held with City, State, Federal Highway Administration and consultant personnel in attendance on January 15, 1973. The descriptions of the streets on the network appears in the preliminary report for future reference. As a result of the determination that the CBD should be treated as a system problem, a travel time study was run by blending a car into the stream of traffic and recording lapsed time at check points in order to determine the average speed through the course. This information is available.

There was no attempt made in the preliminary report to either quantify the problem or to seek a solution. However, the investigation of existing information did reveal that three of the problem areas were under corrective design by others. The three are U. S. 10, 89 and Park Street, 5th and Park Streets, and B and Park Streets which is being accomplished in an F-9999 design by the Department of Highways. The consultant reviewed the proposed improvements and concurred with the Department that the improvements were appropriate for solving the problem at the three locations.

The preliminary report is included in Appendix A.

D. REVIEW

As previously stated, the review of the preliminary report was held in Livingston on January 15, 1973, and, with minor variations, was approved.

CHAPTER III – FIELD STUDIES

Field studies were next conducted to collect information needed to properly analyze traffic conditions and define problems. Much information was already available from the City of Livingston and the Montana Department of Highways. It was not the intent of the field studies to duplicate this information or to conduct an unrelated data collection study. Rather, the field studies were intended to supply only that information needed to conduct the traffic analyses, and this information is on file with the Department of Highways.

A. RAILROAD CROSSINGS

There is a railroad crossing on north 5th Street which is approximately 100 feet north of the intersection of 5th Street and Park Street, and is the only at-grade railroad crossing to the north side of the City. The only other railroad crossing is an underpass on Main Street, which is used as an emergency crossing. However, this underpass is not always accessible. When there is a heavy rain, flooding occurs. This situation was brought up by the City Council and the question was asked if an overpass could be built on 5th Street with TOPICS money. The construction of the overpass in this case is felt to be beyond the scope of the TOPICS program; even though an overpass appears to be justified for other reasons. The blocking of north 5th Street by a train is of vital concern to many people who live on the north side, because school children, who are going home for lunch, have been observed crawling under a train on 5th Street on numerous occasions. It is also noted that recently an occupant in an ambulance in route to a hospital died while waiting for a train blocking 5th Street. The 5th Street crossing, when blocked by the railroad, does cause a back-up of vehicles on Park Street that would be turning onto north 5th Street.

B. PARKING INVENTORY

Restrictions on parking can have a substantial effect on the capacity and safety of a street. A common method of removing bottlenecks and increasing capacity within the scope of a TOPICS project is to remove street parking in specific locations.

An inventory of existing parking regulations on the TOPICS network was made. The inventory determined if parking was allowed at any time, restricted parking was allowed, parking allowed on one side only, or no parking was allowed. Figure No. 4 graphically shows where these regulations are in effect on the designated parking system.

An inventory of existing parking spaces was also taken in the central business district for the express purpose of knowing what the percent of reduction would be if removing some parking were to become necessary in the problem solution period of the study. It was determined that 400 spaces

are available. In observing loading of these spaces, it was ascertained that spaces are available most of the time within a one-block walking distance.

Because of the build-up of new businesses in the outlying areas, especially on U. S. 89 and Park Street, parking spaces within the central business district should not become critical. However, wholesale removal of parking spaces, for any reason, will have a detrimental effect on the downtown business sector unless replaced by additional parking spaces.

C. TRAFFIC CONTROL DEVICE INVENTORY

Traffic control devices regulate and guide the flow of traffic. To operate properly, the traffic control devices must transmit their message to the driver in a clear and concise manner with a minimum of distraction. To do this, the traffic control devices must be readily apparent to the driver and have uniform devices for similar messages.

The Federal Highway Administration's *Manual on Uniform Traffic Control Devices* sets the standards for all traffic control devices. This manual emphasizes the use of graphic illustrations in lieu of words to transmit informative and regulator messages. Many other countries have used this method for some time, and the adoption of this manual is a step toward uniform world-wide traffic control devices.

The Montana Highway Commission formally adopted the *Manual on Uniform Traffic Control Devices* in December, 1971, and all traffic control devices are being changed to conform to this manual. Traffic control devices on Federal Aid Primary and Secondary routes are being updated by Traffic Control Device Project (F-9999 projects) funds. Target dates for completing the update on these routes are 1974 for signs and 1976 for traffic signals.

An inventory of all traffic control devices including traffic signals, regulatory signs, warning signs, guide signs, and illumination on the designated TOPICS network was conducted. Figure No. 5 shows the type and location of existing traffic signals.

D. ROADWAY LIGHTING

A field inventory of roadway lighting was conducted in Livingston on September 21, 1972. As a result of this inventory, it was determined that the existing residential lighting is below standard. However, with this inventory and further accident investigation, it does not appear that the existing residential lighting is a contributing factor in any vehicle accidents. The present lighting on Park Street and the CBD is considered to be very good.

E. TRAFFIC VOLUME AND MOVEMENT

Traffic volumes quantify the traffic flow on the street network, and can be compared to the

theoretical limit of traffic carrying ability (known as capacity) in determining how much more traffic, if any, a street can accommodate.

Traffic volumes were determined in two ways: (1) machine counts with pneumatic tube traffic counters; and (2) manual counts. The Montana Department of Highways supplied machine counts on the major streets. Manual counts were taken to supplement these counts where necessary.

The manual counts were used in computing the 1973 annual average daily traffic (AADT). The manual counts were adjusted for hourly, seasonal and yearly variations in traffic flows and checked against Montana Department of Highways machine counts. This proved to be a very satisfactory method of obtaining AADT with considerable savings in time and expense. Figure No. 6 indicates the location where manual counts were taken. Figure No. 7 indicates the developed 1973 AADT for the TOPICS system with the different bar widths indicating the amount of traffic. Figures No. 26 through 34 are worksheet diagrams of all the manual counts taken.

Figure No. 8 gives historical volumes at selected locations and indicates traffic growth rate. This information is at locations selected by, and from counts conducted by, the Montana Department of Highways.

The manual counts were also necessary to develop turning movement and some pedestrian movement data. Manual counts were taken at nine sites. These manual counts were used as a base for determining the 1973 annual average daily traffic (AADT) as stated above. The AADT was factored to arrive at the design hourly volume. Design hourly volume is defined as the volume that can be expected on the 30th highest hour of the year. The ideal method of obtaining the design hourly volume would be to conduct a continuous count for a full year and merely pick the 30th highest hour of volume from the data. This procedure is obviously not practical in a city of this size. The alternate method used in this study was to factor the AADT. The factors were derived from continuous counts furnished by the Department of Highways.

CHAPTER IV – ANALYSES

A. CAPACITY

Capacity is defined in the Highway Research Board's Highway Capacity Manual as:

> *...the maximum number of vehicles which have a reasonable expectation of passing over a given section of a lane or roadway during a given time period under prevailing roadway and traffic conditions.*

Capacity is a calculated quantity and as such, one must remember that it is not an absolute number. A great deal of research has gone into developing methods of calculating capacity. One of the more complicated is the method of computing intersection capacity. This study addressed itself to the higher volumed signalized intersections when computing capacity. Capacity calculations were accomplished for all existing signalized intersections on the TOPICS system.

In review, capacity is the number of vehicles that an intersection, in this case, can handle.

B. LEVEL OF TRAFFIC SERVICE

Level of traffic service or service level as it is most generally referred to is a measure of driving ease experienced by the driver on a particular segment of the traffic system. The Highway Research Board's Capacity Manual defines six service levels from free flow with virtually no interference, to forced flow (jammed) conditions. For the purpose of this study, a service level of 'C' (of a range from A to E) was chosen as the desirable service level. This is in the zone of stable traffic flow with some acceptable delays and restrictions on the driver occurring. It should be pointed out that service level 'C' in high population areas would be a high service level. However, in lower population areas such as Montana and other western states, service level 'C' is an acceptable level of service. The obvious reason for this is that people in high population areas are used to a greater degree of congestion.

The volume versus capacity ratio is an indication of service level. This V/C ratio is normally computed using the design hourly volume as (V) and the capacity as (C), based upon the service level selected; in this case, service level 'C'. When the V/C ratio results in an answer of from .3 to .7, the segment is considered to be operating satisfactorily. If, however, the V/C ratio is higher than .7, the segment is considered to be operating at a lower service level. Conversely, if the V/C ratio is less than .3, the segment is considered to be operating at a higher service level (perhaps B).

V/C ratios were computed for all signalized intersections and checked for service level using the design hourly volume.

Also, it was concluded that it was necessary to conduct a speed and travel time study on the CBD. These studies were conducted in October and November of 1972 and January of 1973. These comparisons of V/C ratios and speed and travel times resulted in confirming that the major problem

in Livingston is not one of congestion.

The table below indicates the comparison between average speed and service level. The table is reproduced from the Capacity Manual.

TABLE I

LEVELS OF SERVICE FOR DOWNTOWN STREETS

LEVEL OF SERVICE	TRAFFIC FLOW CONDITIONS (APPROXIMATIONS, NOT RIGID CRITERIA)	
	DESCRIPTION	AVERAGE OVERALL SPEED (MPH)
A	Free flow (relatively; some stops will occur)	≥ 25
B	Stable flow (delays not unreasonable)	≥ 20
C	Stable flow (delays significant but acceptable)	≥ 15
D	Approaching unstable flow (delays tolerable)	≥ 10
E	Unstable flow (congestion not due to back-ups ahead)	Below 10 but moving
F	Forced flow (jammed)	Stop-and-go

C. TRAFFIC ACCIDENTS

Traffic accidents for the past three years were obtained from the Livingston City Police. Traffic accidents are an indicator of the safety characteristics of a particular location, and may serve to point out deficiencies. High-accident locations are shown in Figure No. 9. The highest accident rate occurred at the intersection of 5th and Park Streets.

The following table shows the number of accidents, type, and roadway condition for nine intersections for the three-year period from January 1970 to December 1972.

TABLE II

ACCIDENT HISTORY

January 1970 - December 1972

Location	No.	Accident Type				Pavement Condition			
		Right-Angle	Rear-End	Left-Turn	Side-Swipe	Clear & Dry No.	Clear & Dry %	Icy No.	Icy %
Junction B.R. 90 & U.S. 89	1	1				1	100		
Park Street & 5th Street	26	7	16	2	1	12	46	14	54
Park Street & 2nd Street	10	4	3	2	1	6	60	4	40
Park Street & B Street	14	3	9	2		9	64	5	36
5th Street & Front Street	7	4	1	2		5	71	2	29
Callender St. & 2nd Street	11	5	5		1	9	82	2	18
Callender St. & Main Street	7	1	3	2	1	5	71	2	29
Lewis Street & 2nd Street	12	1	7	4		10	83	2	17
Lewis Street & Main Street	7	3	4	—	—	6	86	1	14
Totals	95	29	48	14	4	63	66	32	34

As can be seen from the table, over 1/3 of the accidents occurred during icy conditions. It is probable that an improved program of street sanding would help to reduce this type of accident.

Detailed analysis and collision diagrams were prepared for the problem area intersections.

CHAPTER V – SOLUTIONS TO PROBLEM AREAS

A. QUANTIFICATION OF PROBLEM AREAS

The intersection diagrams that follow are of two types. They are signalized intersections and non-signalized intersections.

At the signalized intersections, the diagrams indicate the ADT, the design hourly volume of each approach, the capacity of each approach, the V/C ratio of each approach, and the accident diagrams for the past three years.

The non-signalized intersections do not indicate a capacity figure for the minor approaches because present technology does not make available a satisfactory method for this calculation. Consequently, no V/C ratio is shown.

This report bases the quantification of the problem areas on the diagrams.

The quantification of intersection problem areas points out again that congestion and traffic flow are not a situation of great concern at the present time. Therefore, the solution period was expended seeking solutions to the railroad crossings at 5th Street and B Street, as well as the problem of traffic signals in the central business district. Signing update on particular segments of the system are also listed as longer term projects.

Signal and safety deficiencies on Park Street at the 5th Street - Park Street, B Street - Park Street, and U. S. 89 - U. S. 10 intersections have been previously noted. However, the traffic control devices and striping on Park Street are being updated in an F-9999 Project. This project includes new signals at the 5th Street - Park Street and B Street - Park Street intersections, and channelization at U. S. 89 - U. S. 10. Therefore, no improvements on Park Street will be recommended in this report.

B. RAILROAD CROSSING AT 5th STREET (PROJECT I)

The major problem with trains blocking 5th Street occurs as a result of train switching operation as opposed to through train traffic. There are eleven through trains. The city has a very good ordinance for the prevention of street crossing blocking. With enforcement of this ordinance and, further, negotiations with the railroad, it would appear that the 5th Street crossing could be open at least during the norning, noon and evening peaks. In reviewing peak hour counts, it was found that the noon hour (12:00 to 1:00 p.m.) counts were very close to the evening counts. Therefore, any negotiations with the railroad should include the noon hour peak.

The following are three alternates to the problem of the 5th Street crossing of the railroad crossing. Figure 4 of Appendix A gives a situation diagram of the crossing and intersection.

Plan No. 1

In order to maintain traffic on Front Street and Park Street, the three railroad tracks would have to be moved closer together to construct a bridge and bring the roadway down to tie into Front Street and Park Street grades. However, by doing this, the 5th Street grade would be approximately 23% with a stop condition at Park Street. The cost of the structure and roadway, excluding relocation of the railroad, would be approximately $80,000.

Plan No. 2

Construct a bridge over the existing railroad, Park Street and Front Street, and tie into present grades at Callender Street and Chinook Street. This plan would result in 10% grades, removal of some existing homes on both sides, no access to 5th Street between Chinook Street and Callender Street. The cost of the structure alone would be approximately $350,000.

Plan No. 3

Consult with Burlington Northern in regard to adjusting their train schedules to eliminate the conflict between traffic on 5th Street and the railroad during the morning, noon, and evening peak hours. It is also suggested that a school guard be established for the grade school children crossing the tracks.

It is recommended that Plan No. 3 be accepted.

C. UNDERPASS AT B STREET (PROJECT II)

Several possible solutions to the problem of flooding of the B Street underpass which in turn cuts off access to the north side were investigated.

First, the possibility of intercepting the water ahead of the underpass and diverting into the railroad switch yard. However, this possibility was discarded because no outfall from the switch yard could be found; consequently, this situation was considered impractical.

Secondly, the possibility of increasing the grate size on the existing inlet was investigated. This solution was discarded because at the present time the grates are completely removed during high runoff periods and the underpass still floods.

Thirdly, the possibility of a pump was investigated. The pump is a theoretical solution. However, the practicalities of the pump station left a great deal to be desired when one considers the fact that a 10,000 GPM pump would be required. Couple this to the maintenance and power requirements along with the lack of reliability during electrical storms and a more practical solution seemed to be demanded.

The recommended solution of the flooding problem is shown on Figure No. 10. This solution combines the reliability of a gravity system with less technical maintenance and reasonable costs. The solution is based upon the installation of a 1.5-foot high, 3-foot wide concrete box the top of which will be at the surface of the existing pavement. The grate will be 14 feet long and 3 feet wide. The

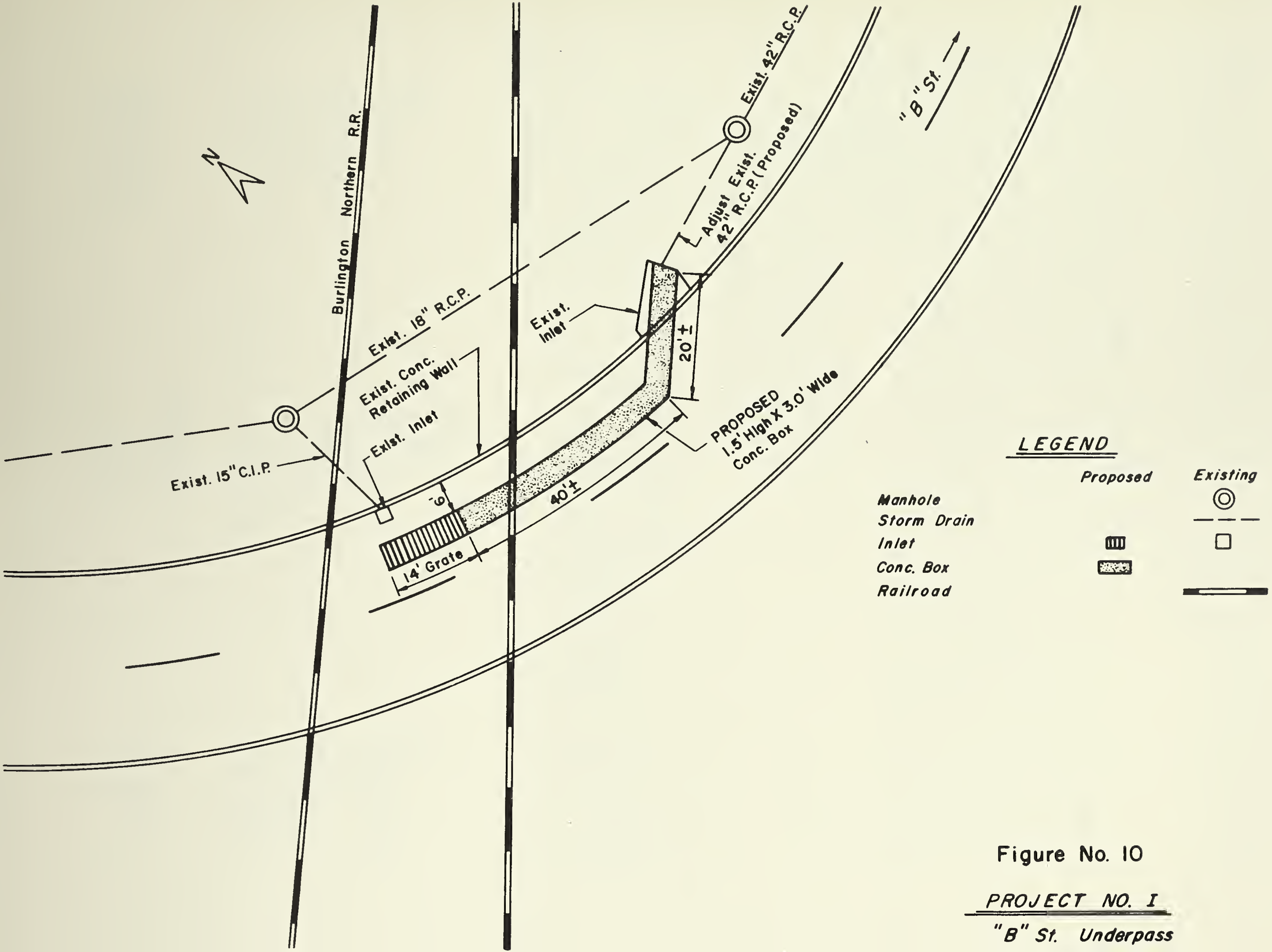


Figure No. 10

PROJECT NO. I

"B" St. Underpass

concrete box will serve as the drain for the underpass and will connect to the existing 48-inch pipe at the existing inlet. The existing 48-inch pipe will have to be lowered from the existing inlet to the existing manhole in order to pick up the flow line of the concrete box.

D. CENTRAL BUSINESS DISTRICT (PROJECT III)

The existing traffic signals in the central business district do not meet the required warrants at the present time. However, because 75% of the warrant is met, it is recommended that the following intersections be re-evaluated just prior to the time when funds are available for updating of the signals. If signals are not warranted at this time, the existing signals should then be removed and stop signs installed. Warrant diagrams for these intersections are shown in Figures 13 through 16. These warrants are for traffic only. A problem in warranting the signals is that the legs have nearly equal volumes of traffic.

1. 2nd Street - Callender Street Intersection
2. 2nd Street - Lewis Street Intersection
3. Main Street - Callender Street Intersection
4. Main Street - Lewis Street Intersection

E. SIGNING AND PAVEMENT MARKINGS UPDATING

As stated before, capacity and congestion are not a major problem in the City of Livingston. However, it is recommended that the signing and pavement markings be updated to improve the existing conditions. The following projects are updating the signing and pavement markings to meet current MUTCD standards.

PROJECT IV

On	From	To
7th Street	Front Street	Montana Street
Montana Street	7th Street	B Street
Front Street	5th Street	Star Road
Star Road	Front Street	W. city limits
5th Street	Chinook Street	Geyser Street

PROJECT V

Gallatin Street	C Street	Park Street
Chinook Street	5th Street	C Street

PROJECT VI

On	From	To
9th Street	U. S. 89	Clarance Street
Geyser Street	U. S. 89	L Street
H Street	Park Street	Geyser Street
M Street	Park Street	Clark Street

PROJECT VII

3rd Street	Park Street	Lewis Street
2nd Street	Park Street	Clark Street
Main Street	Park Street	Geyser Street
B Street	Park Street	Clark Street
C Street	Park Street	Callender Street
Yellowstone Street	Park Street	Callender Street

PROJECT VIII

Callender Street	Yellowstone Street	C Street
Lewis Street	3rd Street	B Street
Clark Street	2nd Street	B Street

CHAPTER VI – COST

The following is a summary of the estimated costs of the projects based upon 1972 prices. These costs were developed using the Montana Department of Highways Tabulation of Low Bid Prices and computations of average prices with regional factors as well as state construction index, price trends.

Project No. I:	
Construction	$ 0
Engineering	0
Total	0
Project No. II:	
Construction	$ 8,500.00
Engineering	1,500.00
Total	$ 10,000.00
Project No. III:	
Construction	$ 80,000.00
Engineering	9,500.00
Total	$ 89,500.00
***Project No. III (Alternate):**	
Construction	$ 4,500.00
Engineering	600.00
Total	$ 5,100.00
Project No. IV:	
Construction	$ 1,650.00
Engineering	350.00
Total	$ 2,000.00
Project No. V:	
Construction	$ 1,600.00
Engineering	300.00
Total	$ 1,900.00
Project No. VI:	
Construction	$ 4,300.00
Engineering	550.00
Total	$ 4,850.00

Project No. VII:

Construction	$ 5,000.00
Engineering	650.00
Total	$ 5,650.00

Project No. VIII:

Construction	$ 3,000.00
Engineering	400.00
Total	$ 3,400.00

Total Estimated Cost of Proposed Projects	$117,300.00
* Total Estimated Cost of Proposed Projects using Project III Alternate	$ 32,900.00

* Project No. III (Alternate) - Removal of existing signals and installation of stop signs.

CHAPTER VII – REVIEW

A review was held with City, State, Federal Highway Administration and the consultant's personnel. The meeting was held in Livingston on May 21, 1973. Minor revisions were requested and completed.

CHAPTER VIII – PRIORITIES

Based upon the type of projects developed as a result of this TOPICS study, it was determined that a point system for project priority would not be required, but to accept the project priority requested by the Livingston city officials.

Proposed Project	Priority
Project No. I (5th Street Railroad Crossing)	1
Project No. II (B Street Underpass)	2
Project No. III (Central Business District Signals)	3
Project No. IV (Signing Update)	4
Project No. V (Signing Update)	5
Project No. VI (Signing Update)	6
Project No. VII (Signing Update)	7
Project No. VIII (Signing Update)	8

CHAPTER IX – REVIEW

A. TRAFFIC REGULATIONS, REVIEW

A complete review was made of traffic and parking regulations of the City of Livingston. The only recommendations that this report has to offer is to enforce more strongly the ordinances on trains blocking intersections.

B. PROFESSIONAL CAPABILITIES, REVIEW

The City of Livingston has available to it professional traffic engineering services from the Montana Department of Highways, the Montana Highway Traffic Safety Office and qualified consultants in the state. With these professional services available, Livingston has the capability of carrying on a continuing traffic program.

Figure No. 1

TOPICS SYSTEM

CITY of LIVINGSTON
TOPICS STUDY

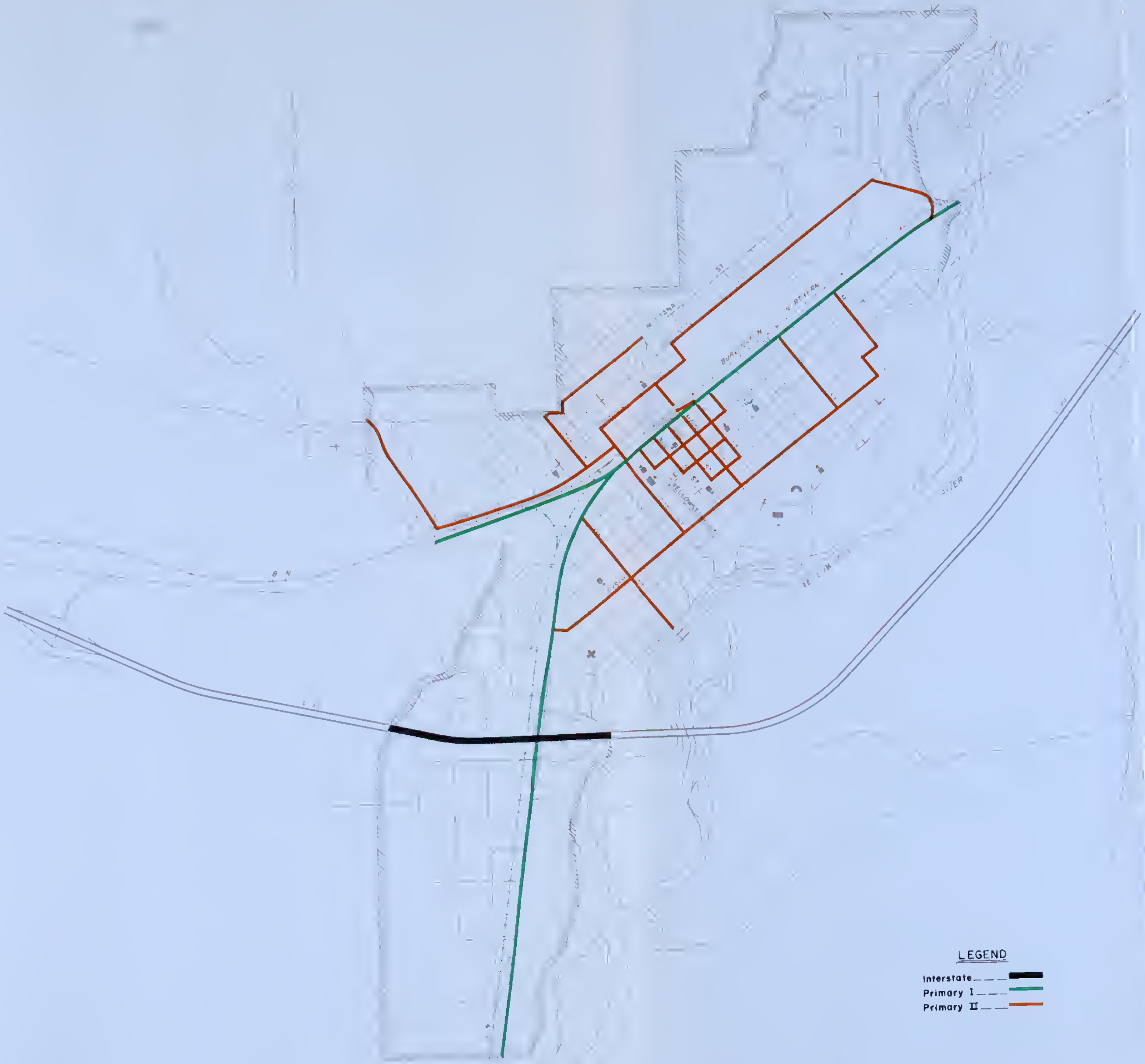


Figure No 1

TOPICS SYSTEM

CITY of LIVINGSTON
TOPICS STUDY

LEGEND

tate	▬
ecting Links Of Rural Principal Arterials	▬
ecting Links Of Rural Minor Arterials	▪▪▪▪▪
Principal Arterials	‖‖‖‖‖‖
Arterial Streets	▬
tar Streets	▬

Figure No. 2

1990
FUNCTIONAL CLASSIFICATION

CITY of LIVINGSTON
TOPICS STUDY

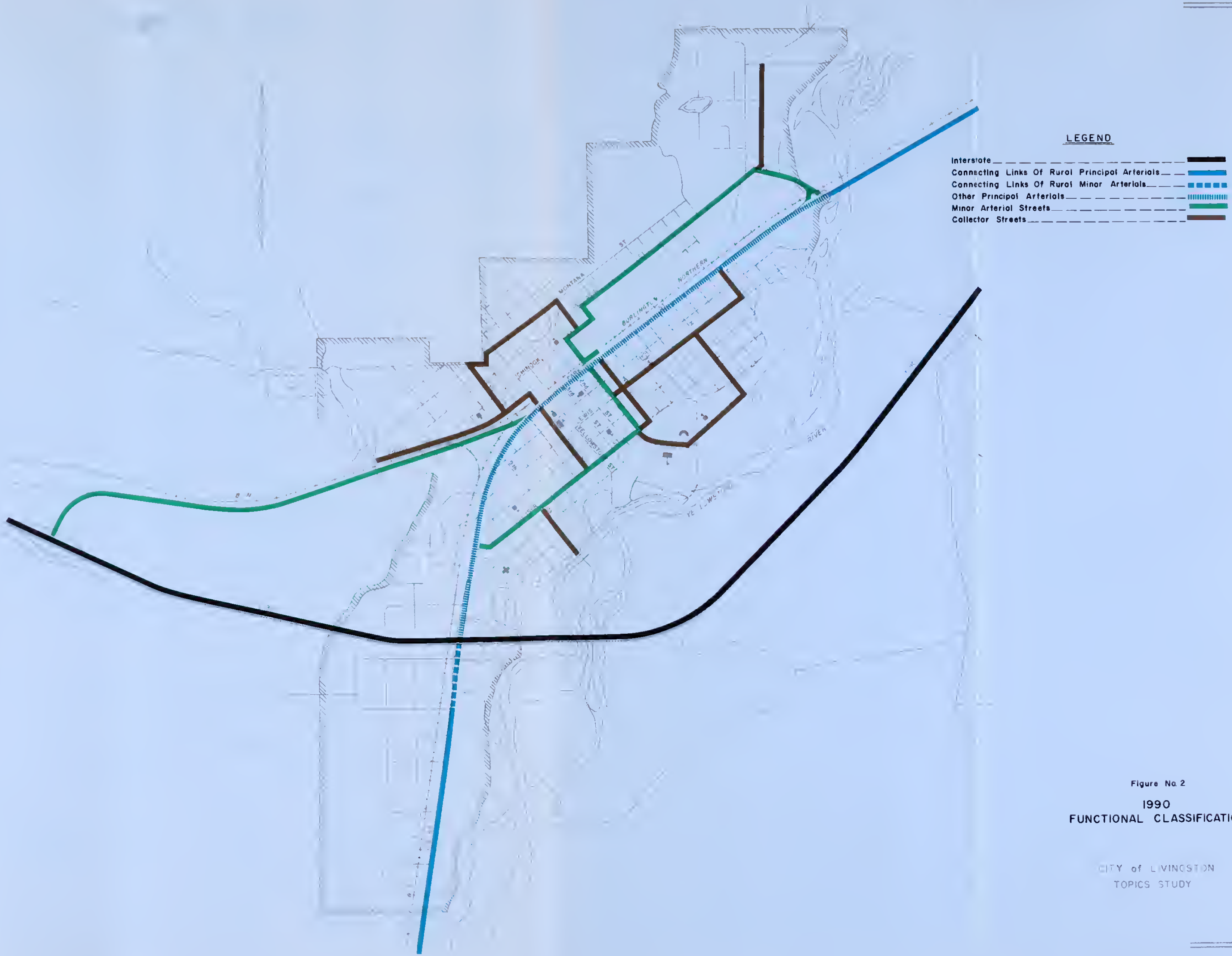


Figure No. 2

1990
FUNCTIONAL CLASSIFICATION

CITY of LIVINGSTON
TOPICS STUDY

POPULATION TRENDS

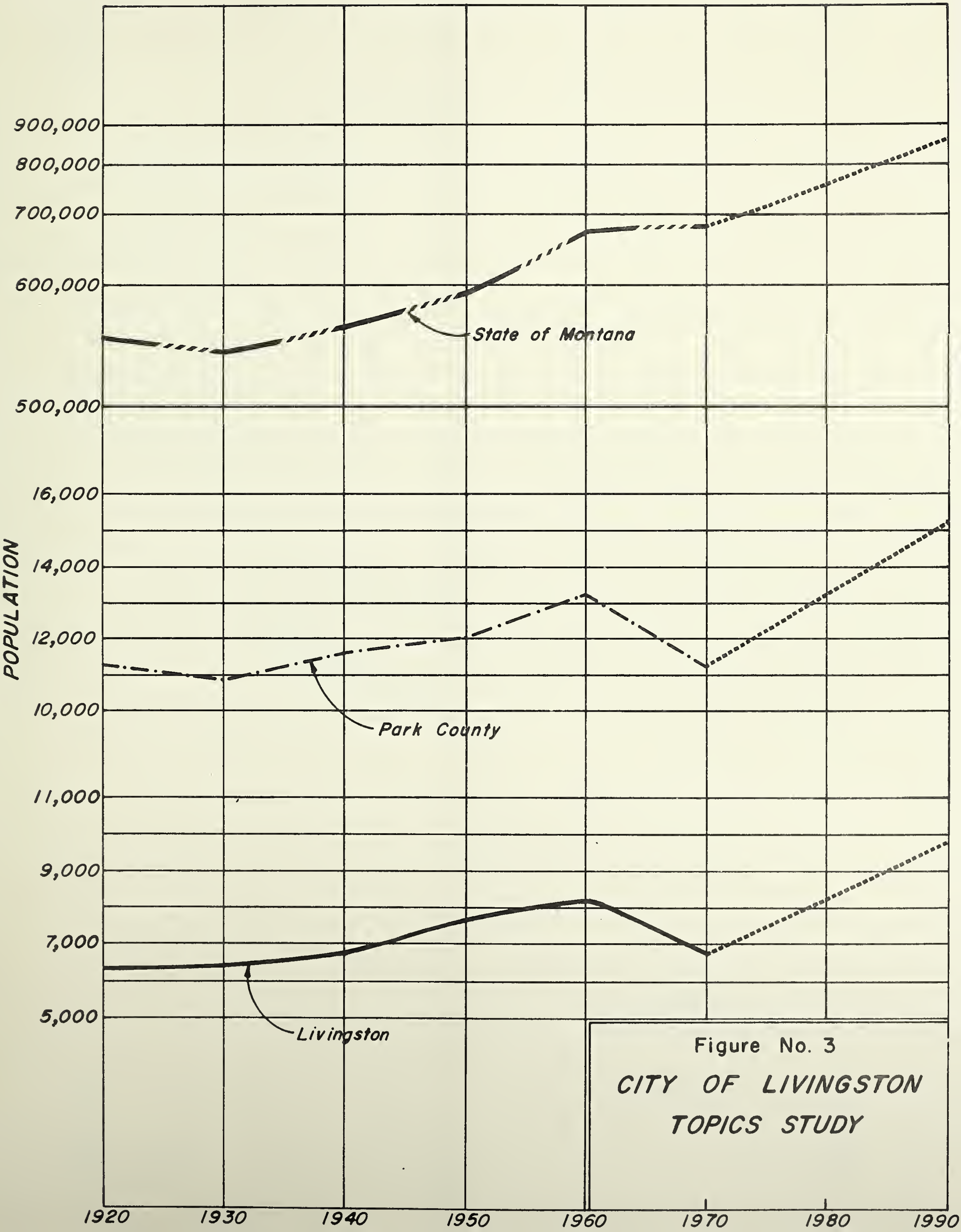


Figure No. 3
CITY OF LIVINGSTON
TOPICS STUDY

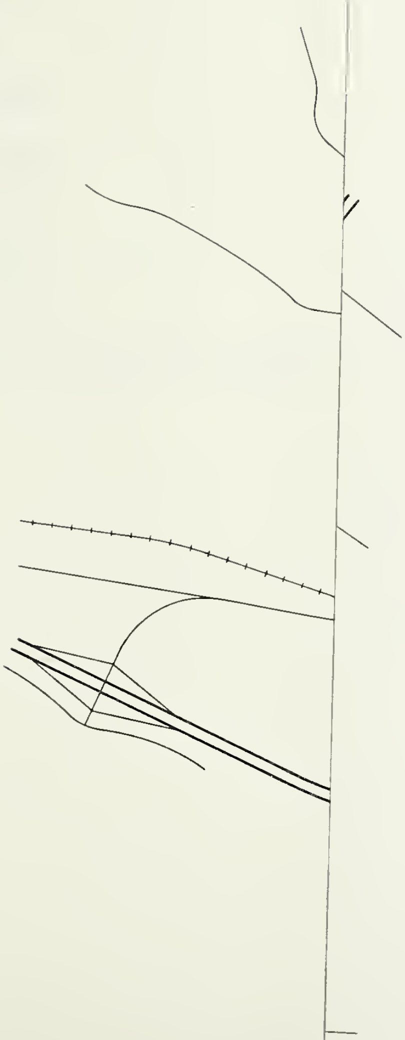


Figure No. 4

PARKING REGULATIONS

CITY of LIVINGSTON
TOPICS STUDY

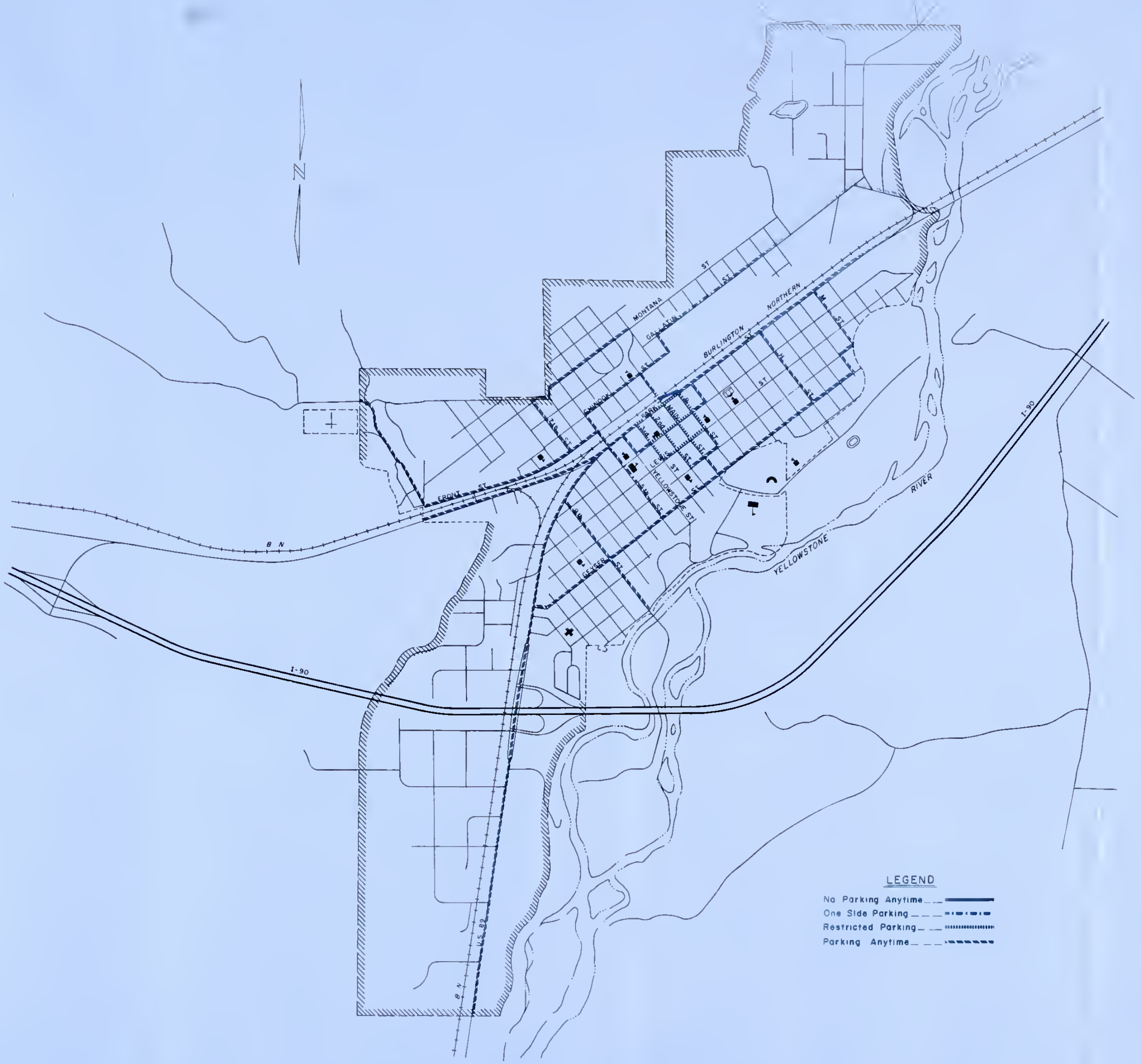


Figure No 4

PARKING REGULATIONS

CITY of LIVINGSTON
TOPICS STUDY

FIGURE NO. 5

EXISTING TRAFFIC SIGNALS

Signalized Intersections	Pre-Timed	Semi-Actuated	Flasher	Interconnected
Park Street & 5th Street	x			
Park Street & B Street	x			
Callender St. & 2nd Street	x			
Callender St. & Main Street	x			
Lewis Street & 2nd Street	x			
Lewis Street & Main Street	x			
Main Street & Clark Street			x	

FIGURE NO. 6

LIST OF MANUAL COUNT LOCATIONS

1. Junction - B. R. 90 and U. S. 89
2. Park Street and 5th Street
3. Front Street and 5th Street
4. Park Street and 2nd Street
5. Park Street and B Street
6. Callender Street and 2nd Street
7. Callender Street and Main Street
8. Lewis Street and 2nd Street
9. Lewis Street and Main Street

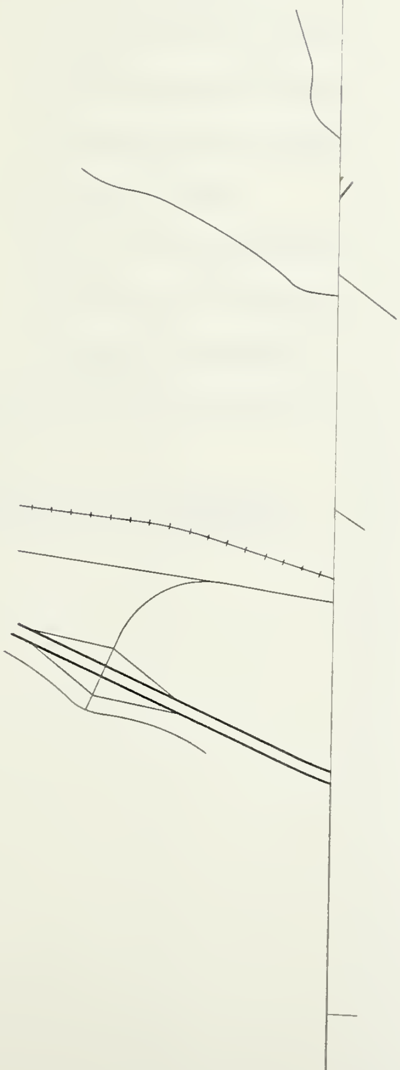


Figure No. 7

AVERAGE DAILY TRAFFIC

CITY of LIVINGSTON
TOPICS STUDY

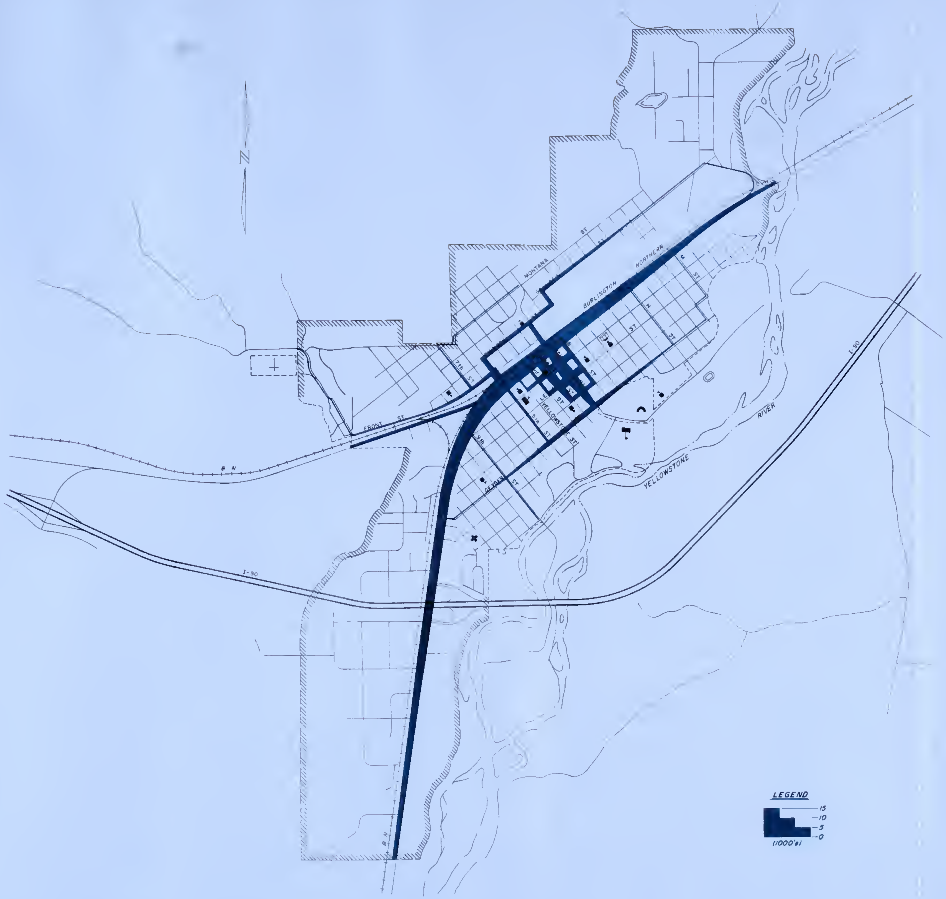


Figure No 7

AVERAGE DAILY TRAFFIC

CITY of LIVINGSTON
TOPICS STUDY

FIGURE NO. 8

ADT COMPARISON

LOCATION		1970 ADT*	1973 ADT*
ON	BETWEEN		
B. R. 90	9th Street and 10th Street	1,375	1,280
U. S. 89	9th Street and 8th Street	7,017	8,210
U. S. 89	Clark Street and Geyser Street	4,256	4,870
U. S. 89	South of 4-lane	3,898	2,760
Park Street	6th Street and 5th Street	8,724	7,840
Park Street	B Street and C Street	6,779	6,790
Park Street	H Street and I Street	5,529	5,340

* ADT from Montana Department of Highways.

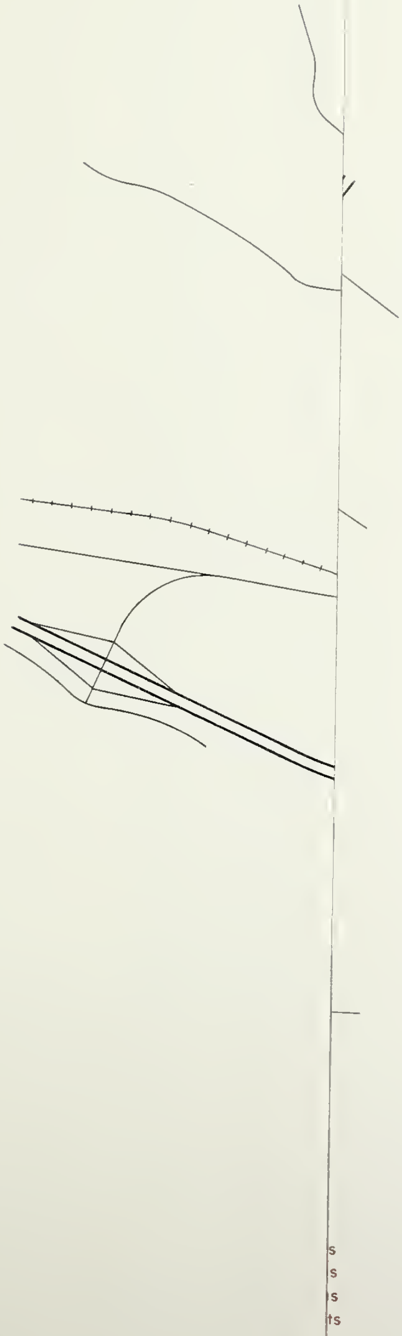


Figure No. 9

HIGH ACCIDENT LOCATIONS

CITY of LIVINGSTON
TOPICS STUDY

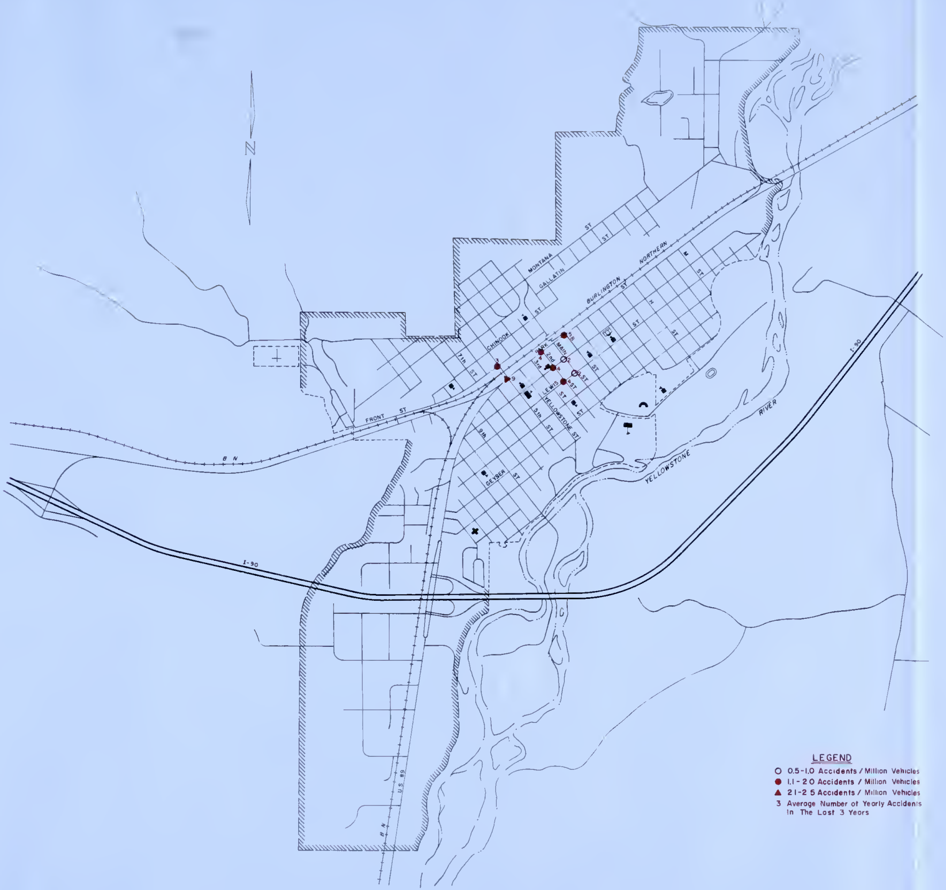

N
MONTANA
ST
GALLATIN
ST
BURLINGTON
NORTHERN
ST
CHINOOK
ST
7th
ST
PARK
MAIN
2nd
3rd
LEWIS
ST
YELLOWSTONE ST
5th
ST
9th
GEYSER
ST
FRONT
ST
B N
I-90
I-90
YELLOWSTONE
RIVER
US 89
B N
3
9
4
5.8
2
2
4
LEGEND
○ 0.5-1.0 Accidents / Million Vehicles
● 1.1-2.0 Accidents / Million Vehicles
▲ 2.1-2.5 Accidents / Million Vehicles
3 Average Number of Yearly Accidents In The Last 3 Years

Figure No 9

HIGH ACCIDENT LOCATIONS

CITY of LIVINGSTON
TOPICS STUDY

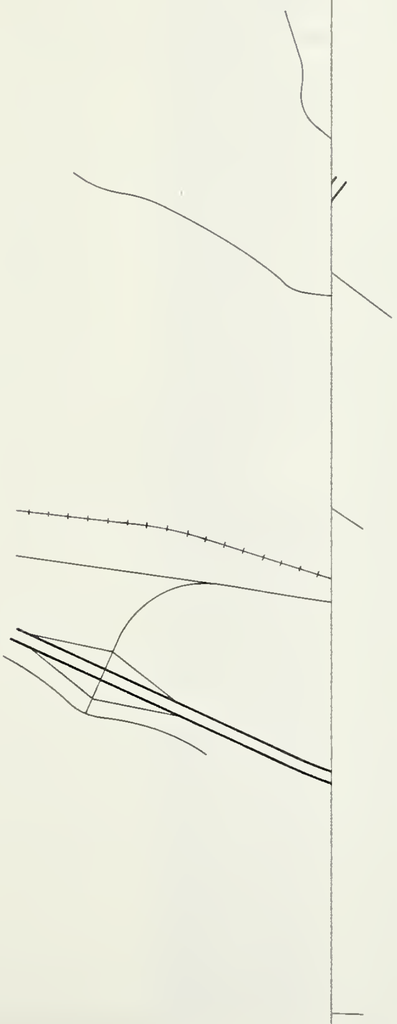


Figure No. 11

AREA CLASSIFICATION
FOR
CAPACITY DETERMINATION

CITY of LIVINGSTON
TOPICS STUDY

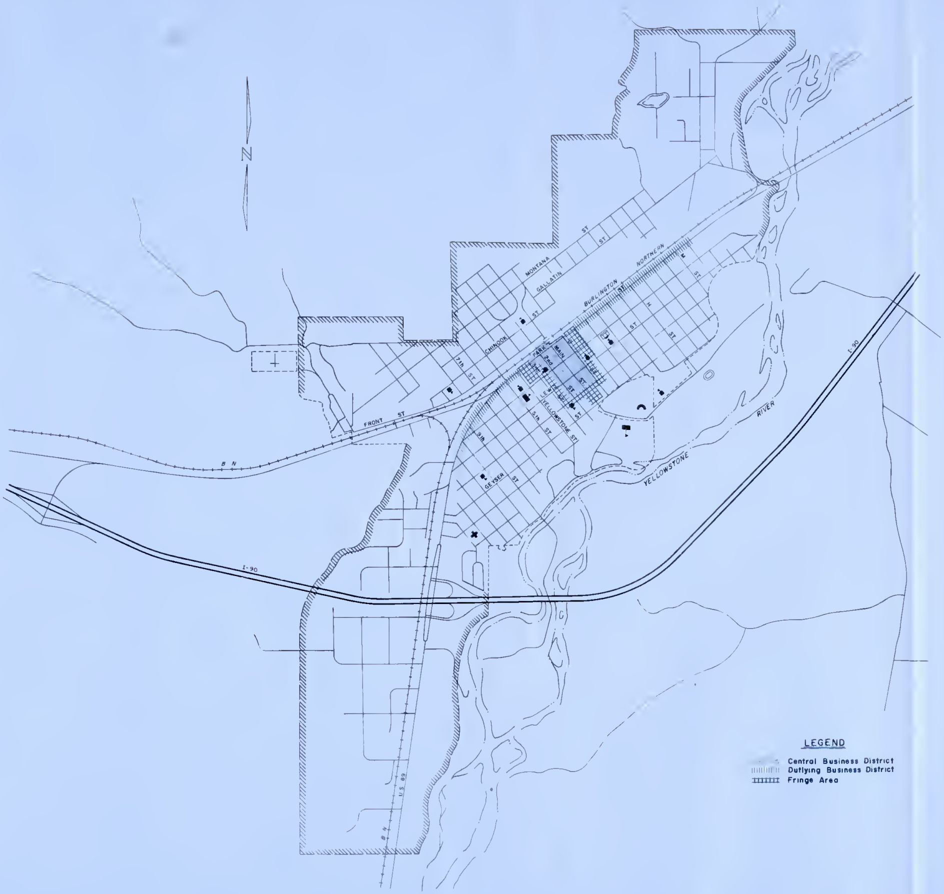


Figure No 11

AREA CLASSIFICATION
FOR
CAPACITY DETERMINATION

CITY of LIVINGSTON
TOPICS STUDY

FIGURE NO. 12

PAVEMENT WIDTHS

ON	BETWEEN	WIDTH (Feet)
B. R. 90	West city limits & U.S. 89-Park St. Junction	36
Park Street	U. S. 89-Park St. Junction and B Street	41 to 50
Park Street	B Street and H Street	38 to 49
Park Street	H Street and East city limits	27 to 38
Star Road	North city limits to Front Street	20
Front Street	Star Road to 9th Street	20
Front Street	9th Street to 5th Street	31 to 34
Chinook Street	5th Street to C Street	38
North C Street	Chinook Street to Gallatin Street	38
Gallatin Street	C Street to H Street	38
Gallatin Street	H Street to U. S. 10	20 to 23
North 7th Street	Front Street to Montana Street	27 to 38
Montana Street	7th Street to B Street	32 to 36
5th Street	Chinook Street to Geyser Street	38
U. S. 89	South city limits to 4-lane	36
U. S. 89	4-lane	68
U. S. 89	North end of 4-lane to 7th Street	35 to 45
Callender Street	Yellowstone Street to C Street	40 to 46
Lewis Street	3rd Street to B Street	46 to 50
Clark Street	2nd Street to B Street	38
Clark Street	L Street to M Street	38
Geyser Street	U. S. 89 to 13th Street	28
Geyser Street	13th Street to L Street	38 to 50
9th Street	U. S. 89 to Clarance Street	34 to 38
Yellowstone Street	Park Street and Callender Street	47
3rd Street	Park Street and Lewis Street	38
2nd Street	Park Street and Clark Street	38 to 46
Main Street	Park Street and Geyser Street	56
B Street	Park Street and Clark Street	38 to 50
C Street	Park Street and Callender Street	38 to 50
H Street	Park Street and Geyser Street	38
L Street	Clark Street and Geyser Street	32 to 38
M Street	Park Street and Clark Street	32 to 38

FIGURE NO. 13

TRAFFIC SIGNAL WARRANT

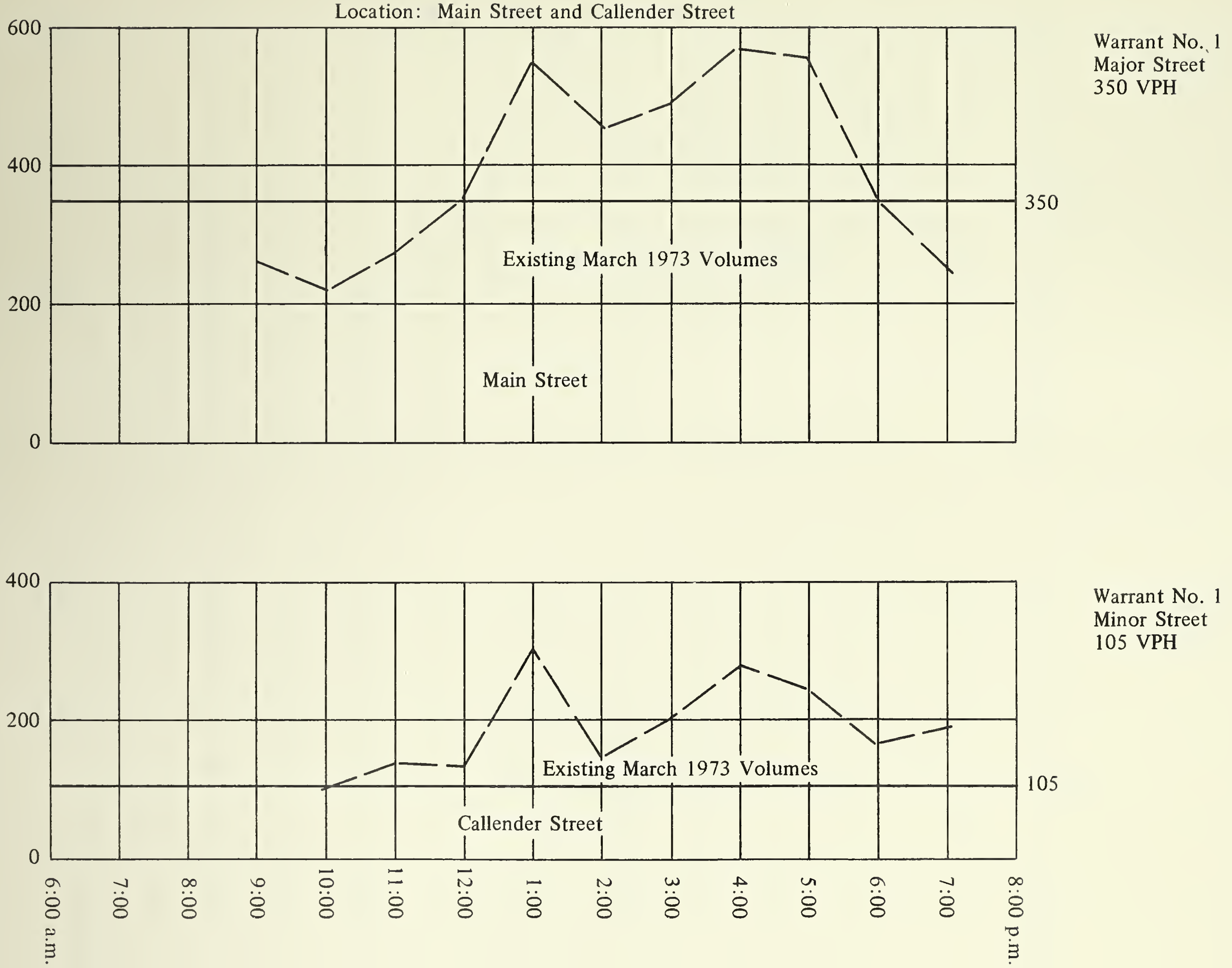


FIGURE NO. 14

TRAFFIC SIGNAL WARRANT

Location: Main Street and Lewis Street

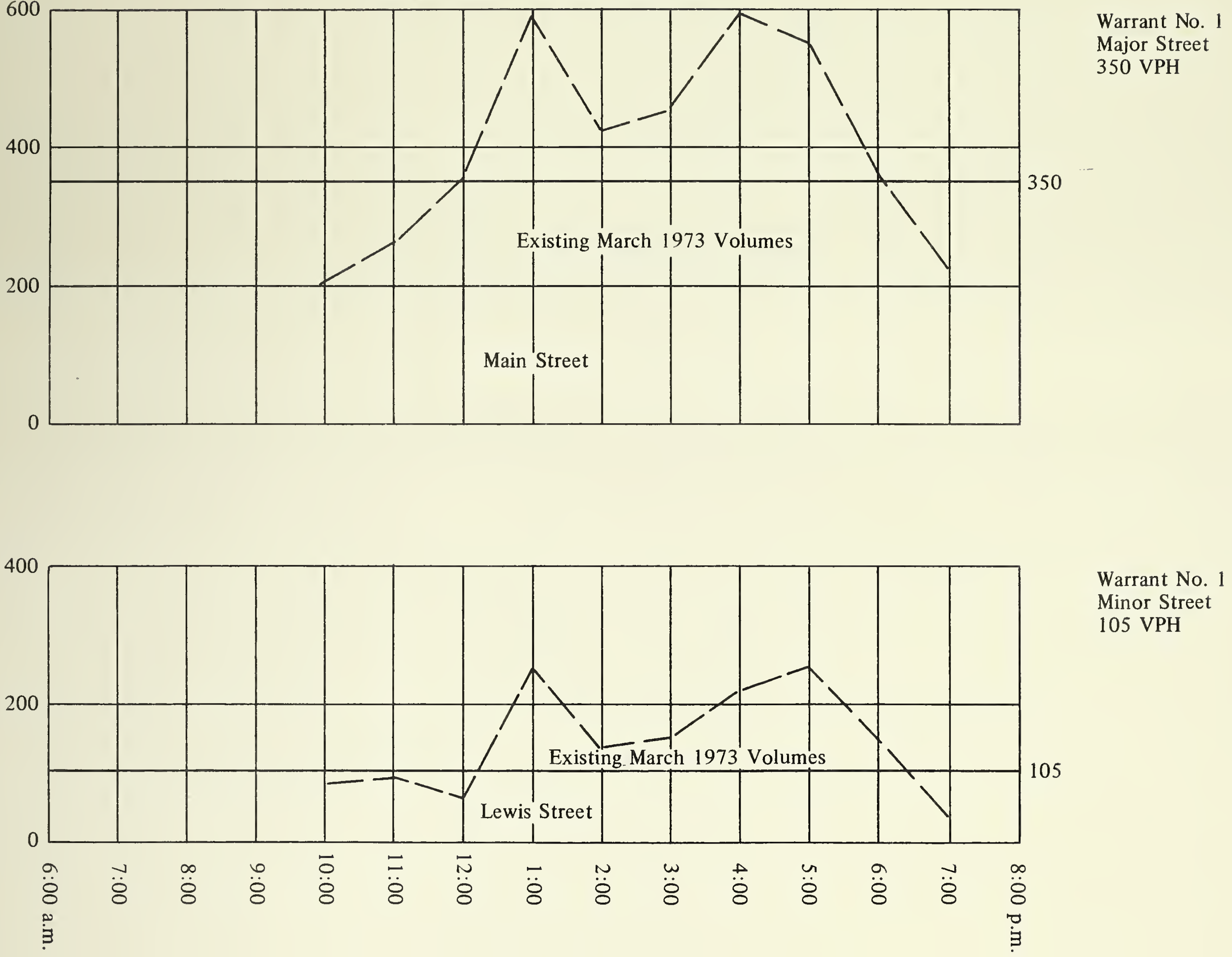


FIGURE NO. 15

TRAFFIC SIGNAL WARRANT

Location: 2nd Street and Callender Street

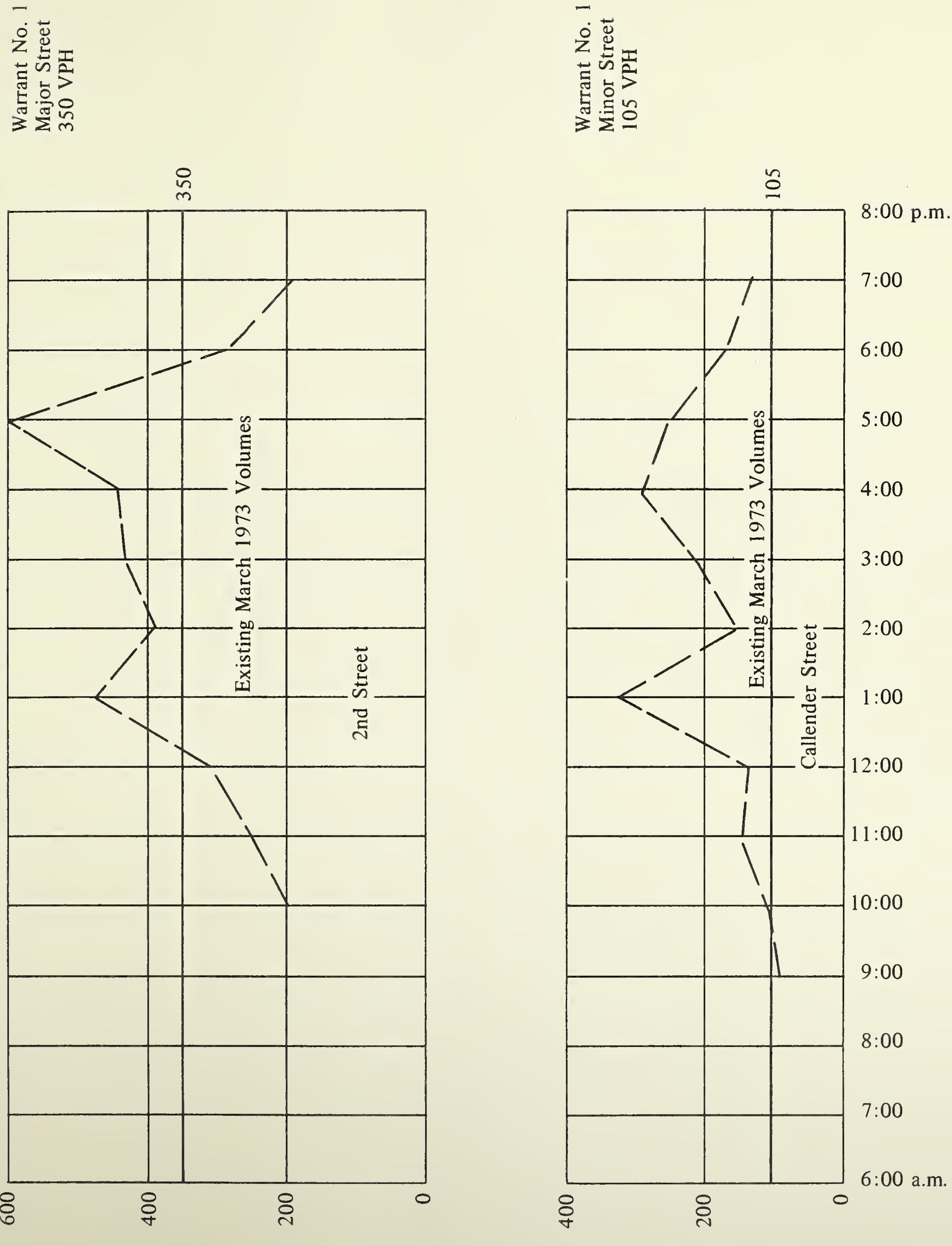


FIGURE NO. 16

TRAFFIC SIGNAL WARRANT

Location: 2nd Street and Lewis Street

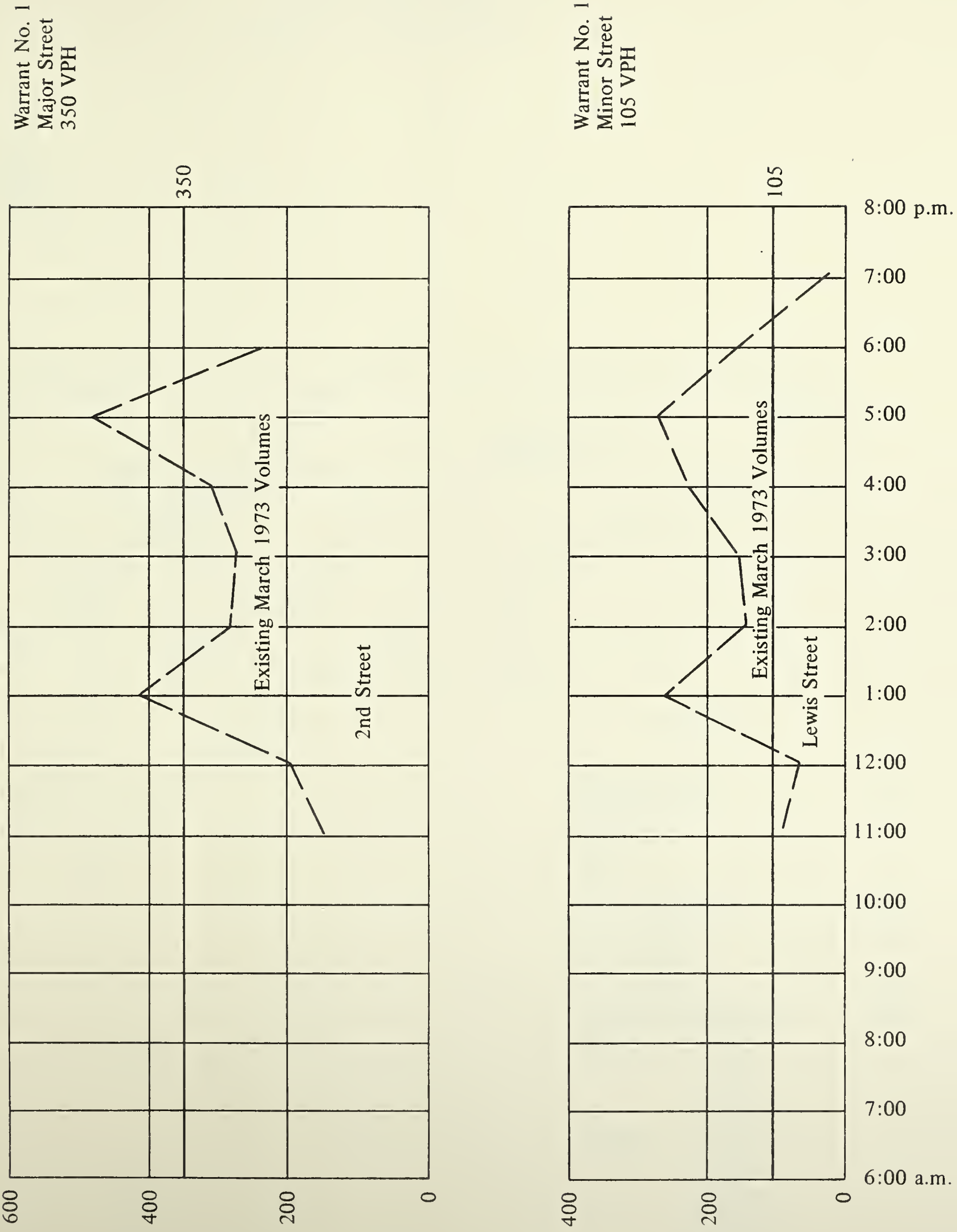
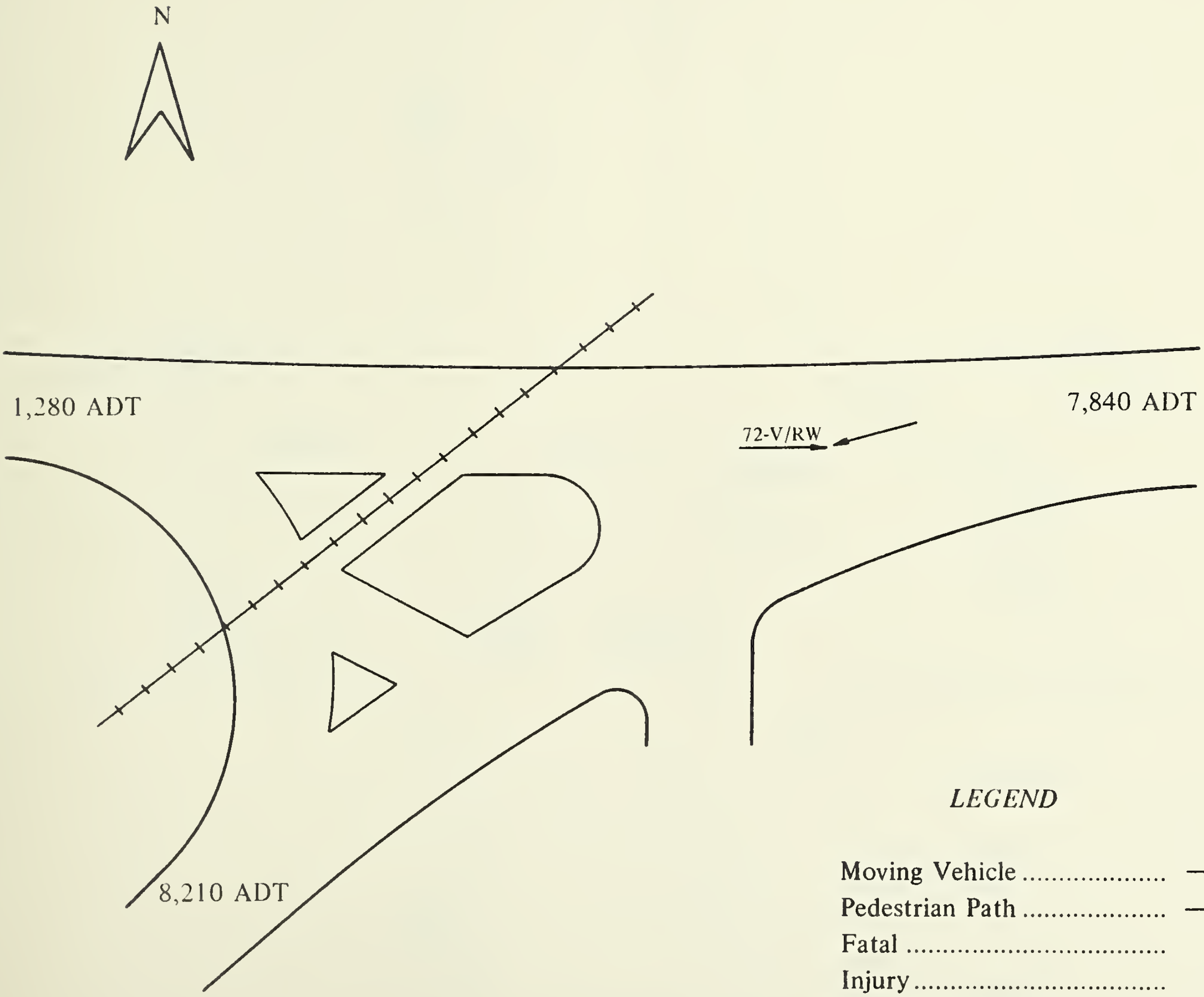


FIGURE NO. 17

INTERSECTION DATA

Junction U. S. 89 & U. S. 10



LEGEND

Moving Vehicle	——→
Pedestrian Path	– – →
Fatal	●
Injury	○
Rear-end Collision	—+—
Parked Vehicle	▨
Fixed Object	□
Out of Control	∼∼→
Violated Right-of-Way	V/RW
Pavement:	D= Dry I= Icy W= Wet
Weather:	C= Clear F= Fog R= Rain SL= Sleet S= Snow
Driving While Intoxicated....	DWI

FIGURE NO. 18

INTERSECTION DATA

5th Street & Park Street

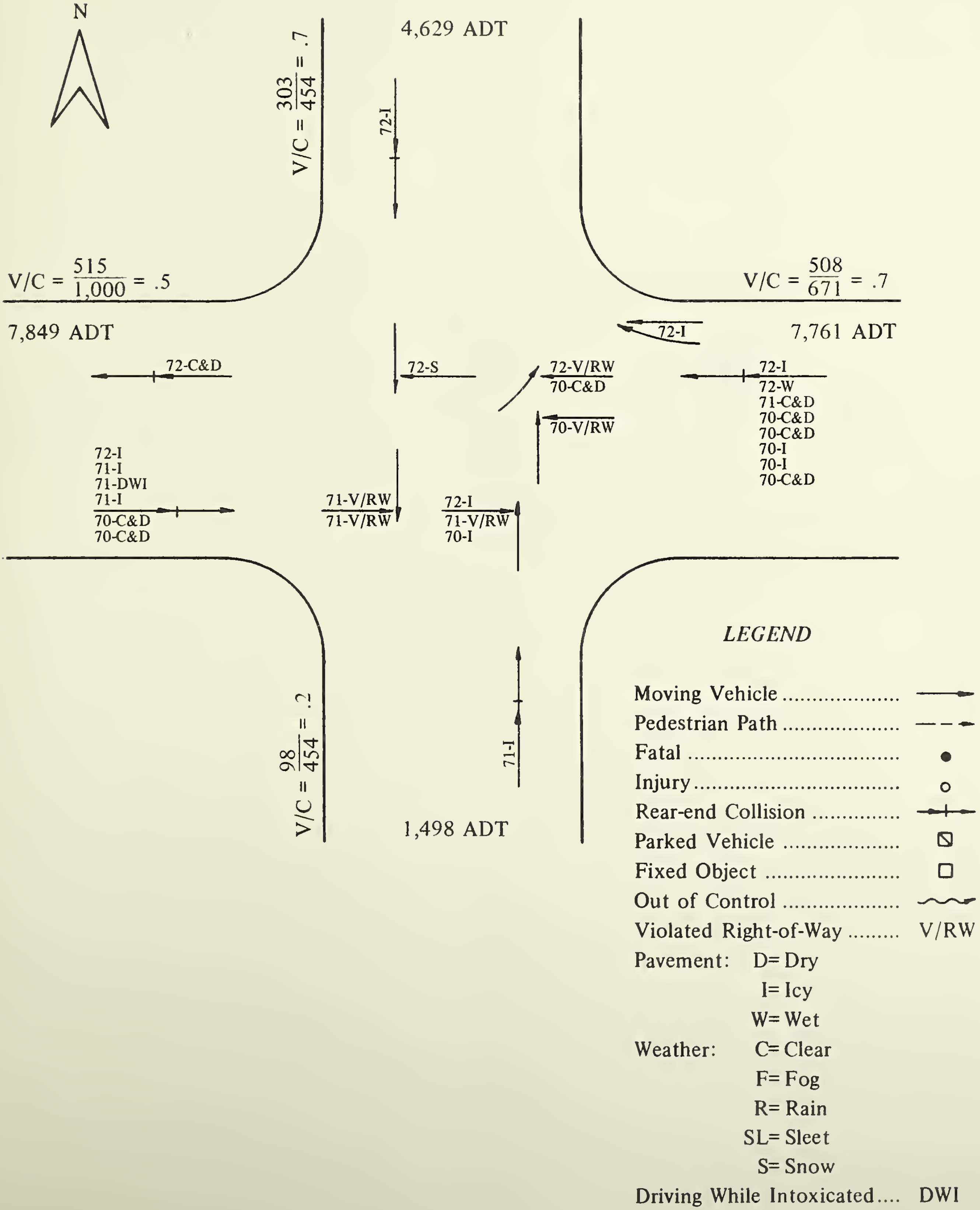
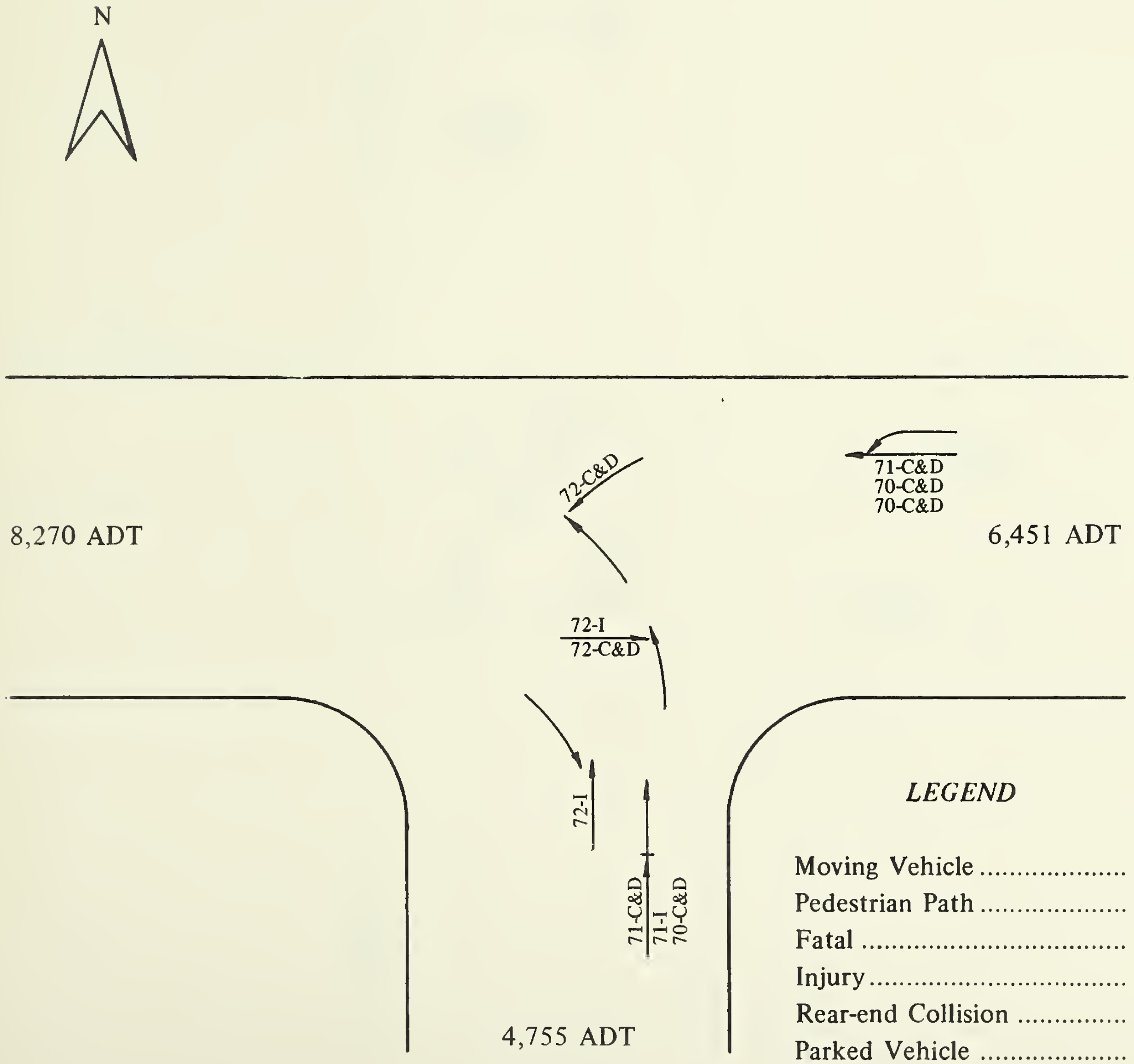


FIGURE NO. 19
INTERSECTION DATA

2nd Street & Park Street



LEGEND

Moving Vehicle	⟶
Pedestrian Path	– – →
Fatal	●
Injury	○
Rear-end Collision	→+→
Parked Vehicle	▧
Fixed Object	□
Out of Control	〰→
Violated Right-of-Way	V/RW
Pavement: D= Dry	
I= Icy	
W= Wet	
Weather: C= Clear	
F= Fog	
R= Rain	
SL= Sleet	
S= Snow	
Driving While Intoxicated....	DWI

FIGURE NO. 20

INTERSECTION DATA

B Street & Park Street

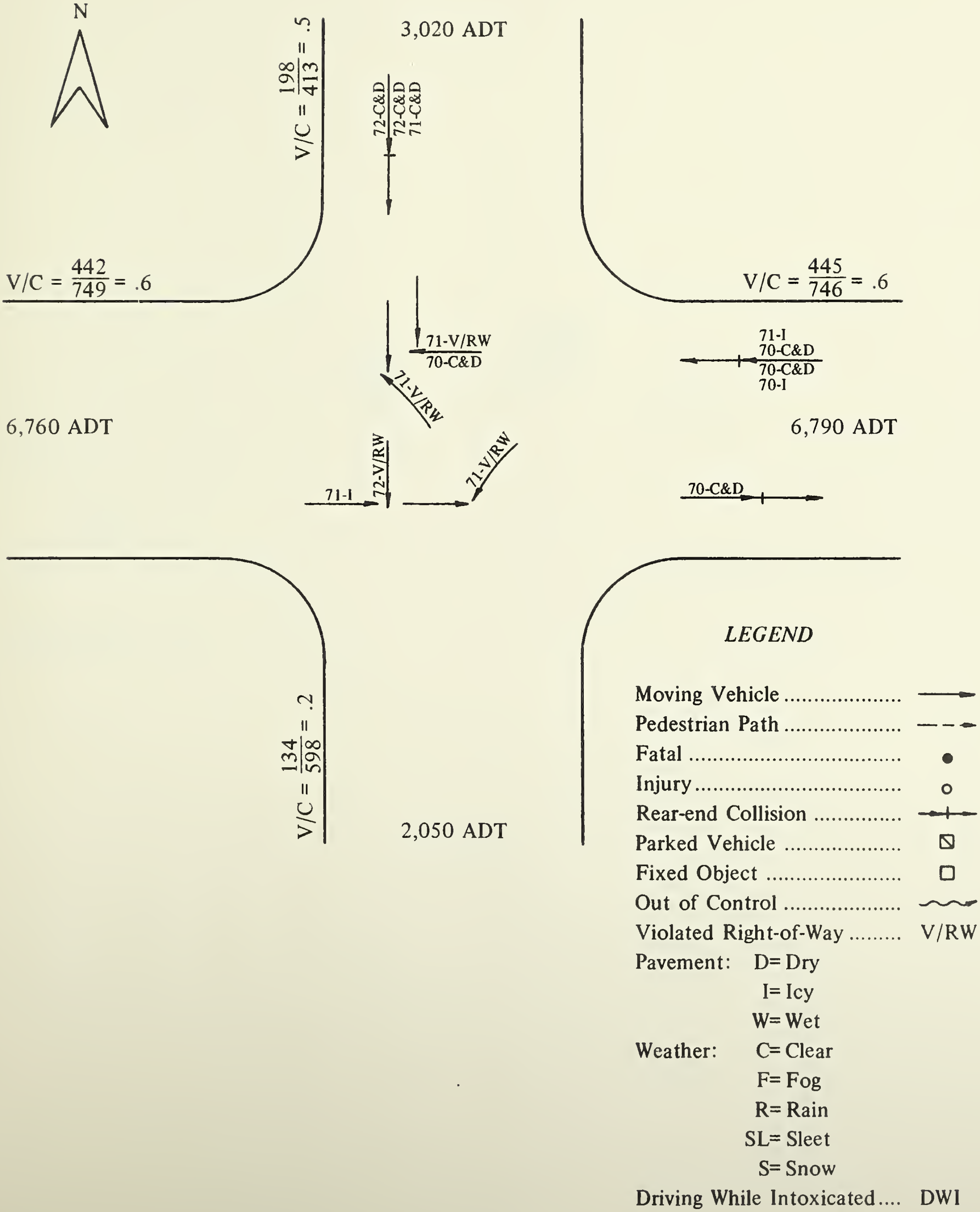
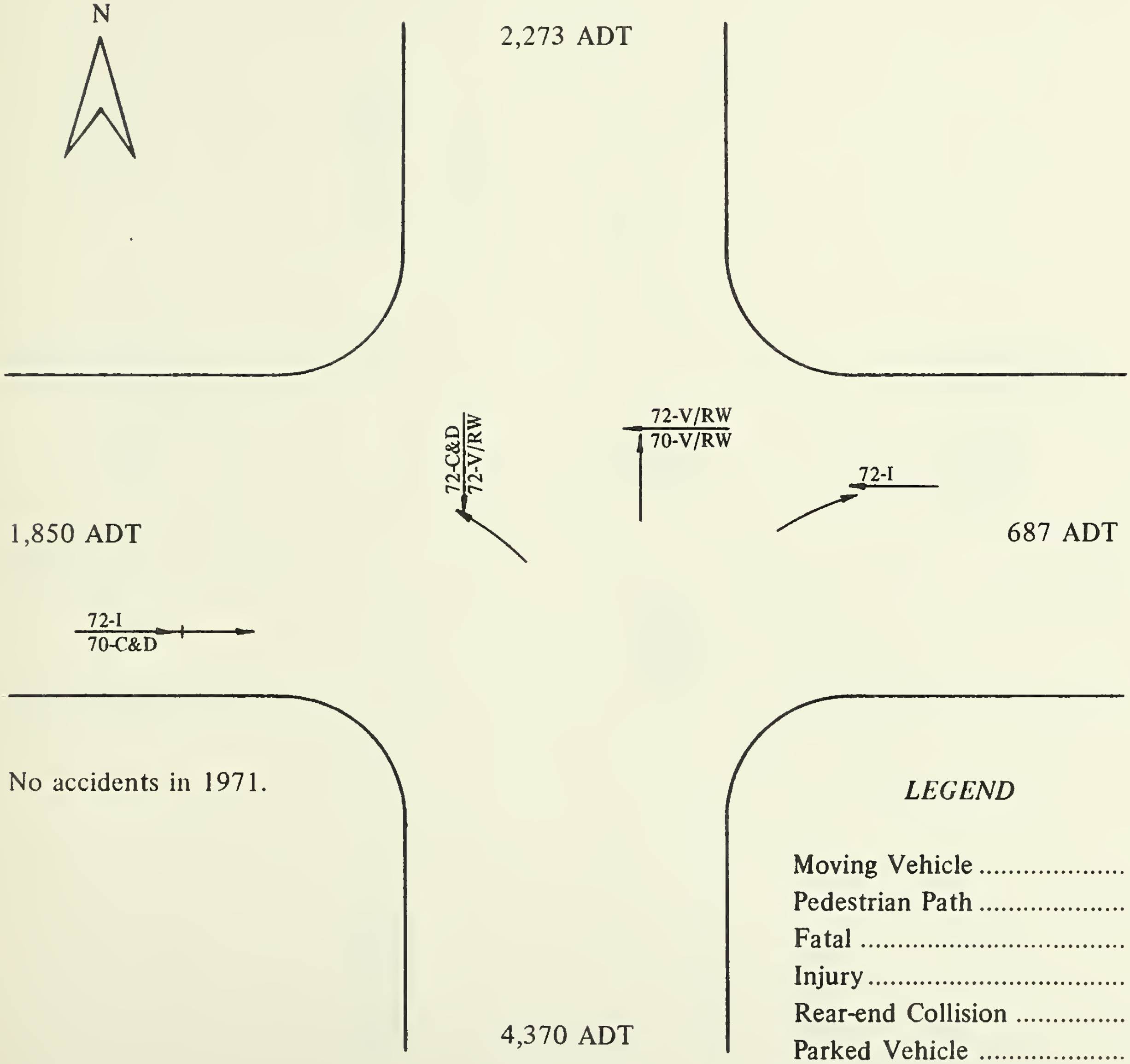


FIGURE NO. 21

INTERSECTION DATA

5th Street & Front Street



No accidents in 1971.

LEGEND

Moving Vehicle	——→
Pedestrian Path	– – →
Fatal	●
Injury	○
Rear-end Collision	→+→
Parked Vehicle	⧄
Fixed Object	☐
Out of Control	∿→
Violated Right-of-Way	V/RW

Pavement: D= Dry
I= Icy
W= Wet

Weather: C= Clear
F= Fog
R= Rain
SL= Sleet
S= Snow

Driving While Intoxicated .... DWI

FIGURE NO. 22
INTERSECTION DATA
2nd Street & Lewis Street

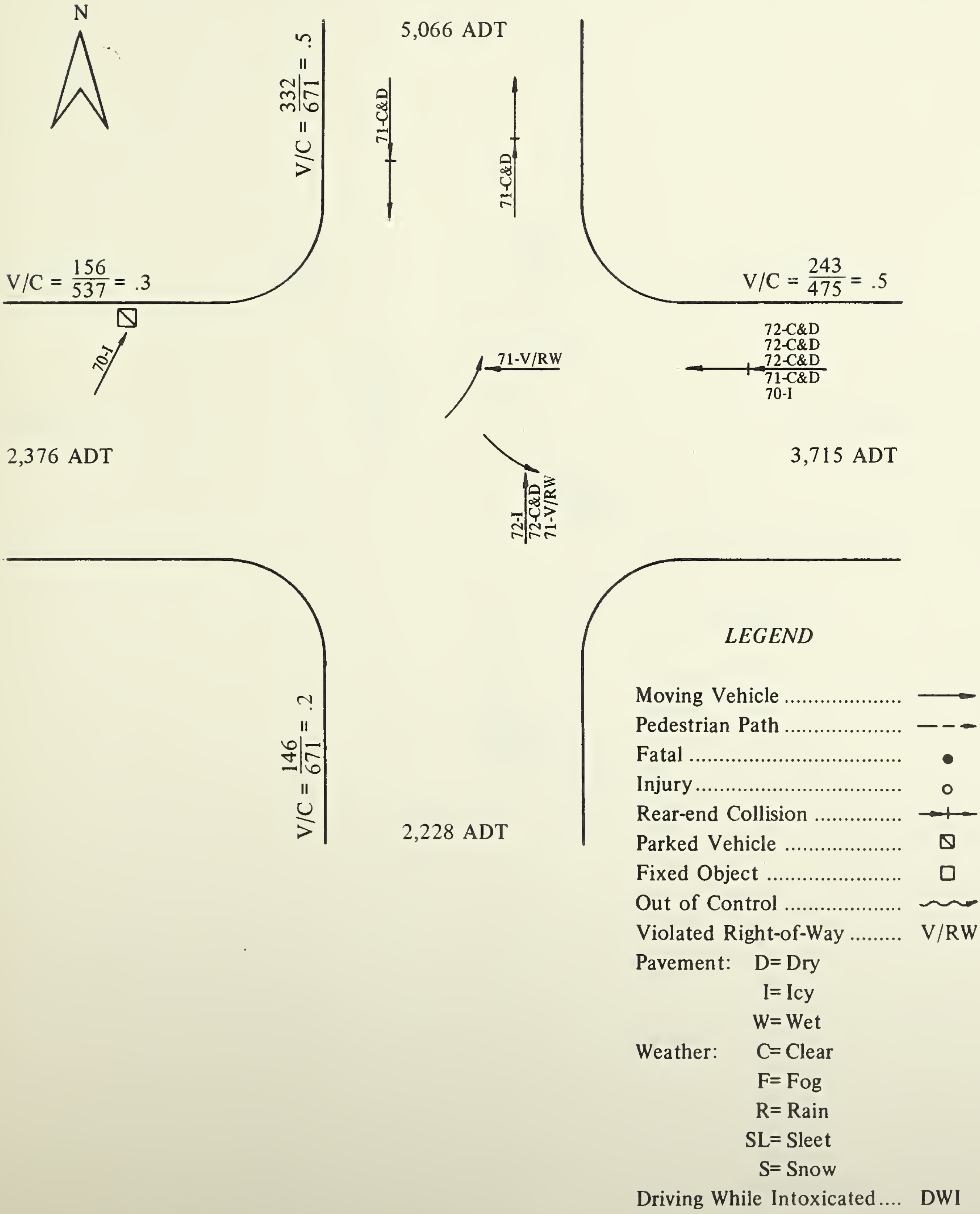


FIGURE NO. 23

INTERSECTION DATA

2nd Street & Callender Street

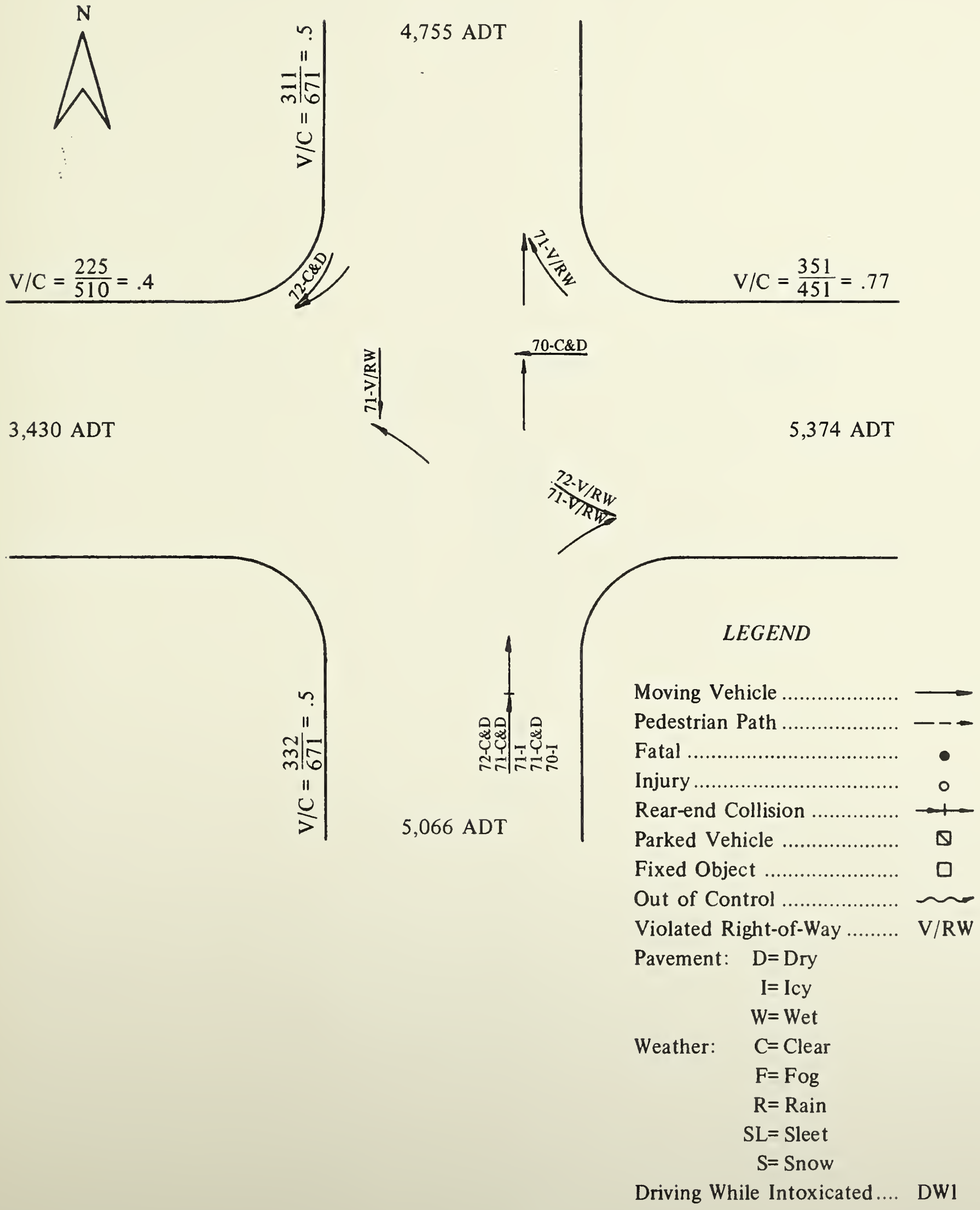
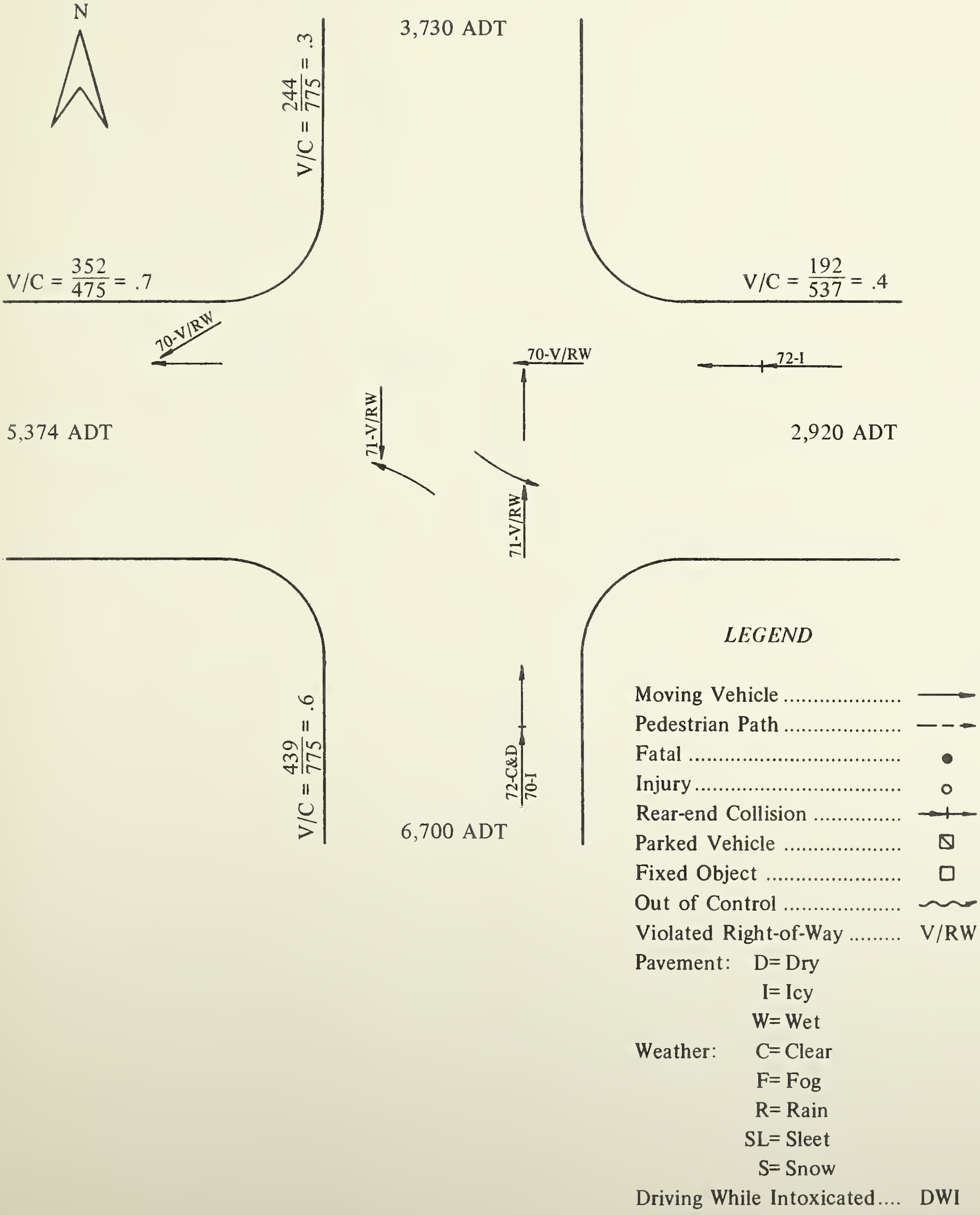


FIGURE NO. 24

INTERSECTION DATA

Main Street & Callender Street



LEGEND

Moving Vehicle	⟶
Pedestrian Path	– – →
Fatal	●
Injury	○
Rear-end Collision	–+–
Parked Vehicle	⧄
Fixed Object	□
Out of Control	∿→
Violated Right-of-Way	V/RW
Pavement:	D= Dry I= Icy W= Wet
Weather:	C= Clear F= Fog R= Rain SL= Sleet S= Snow
Driving While Intoxicated....	DWI

FIGURE NO. 25

INTERSECTION DATA

Main Street & Lewis Street

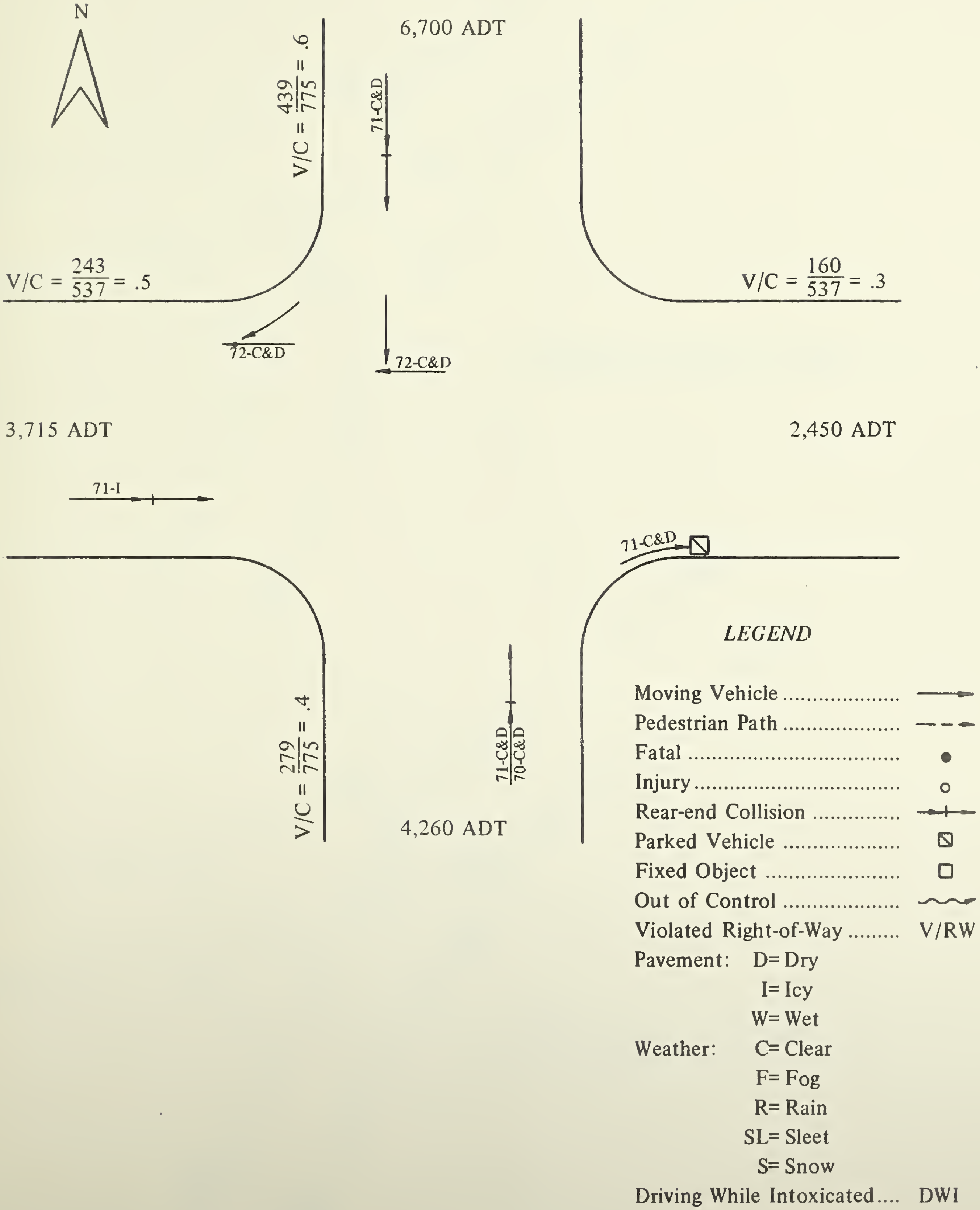
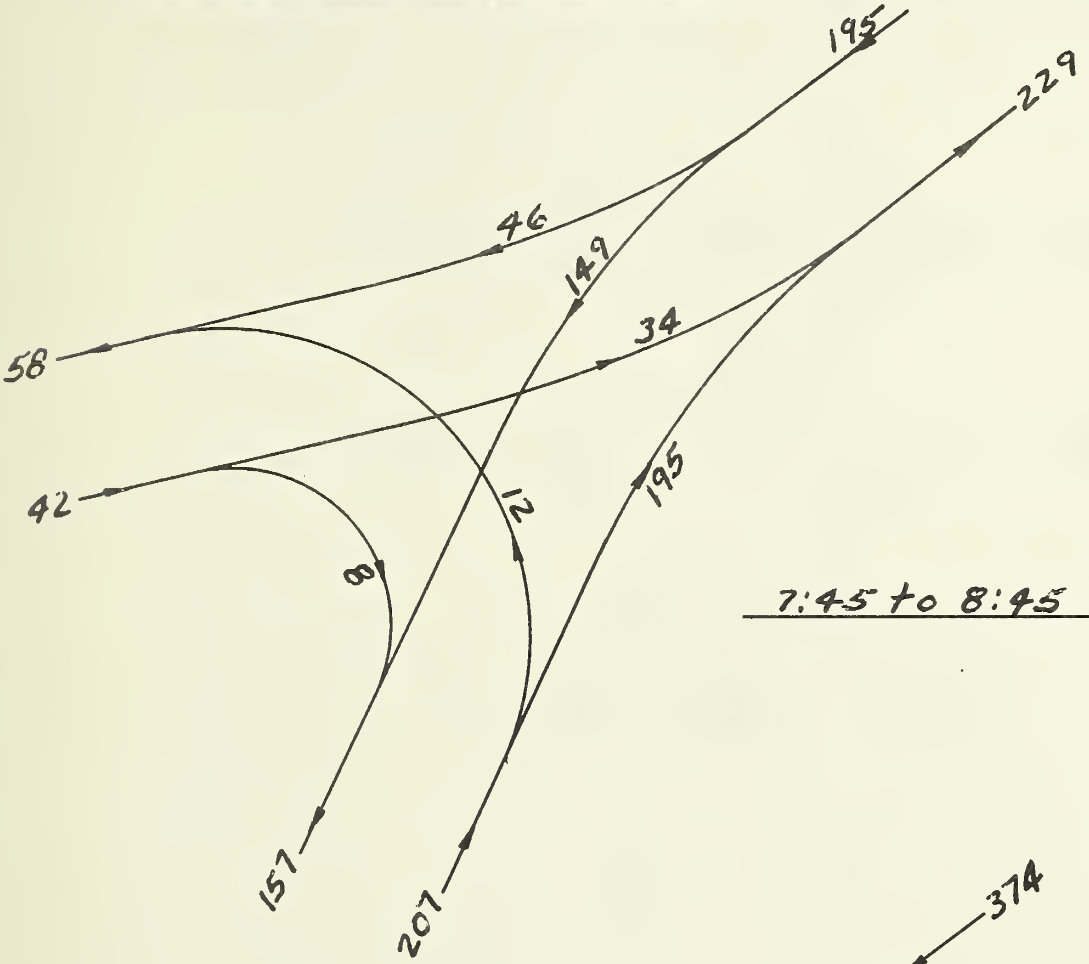
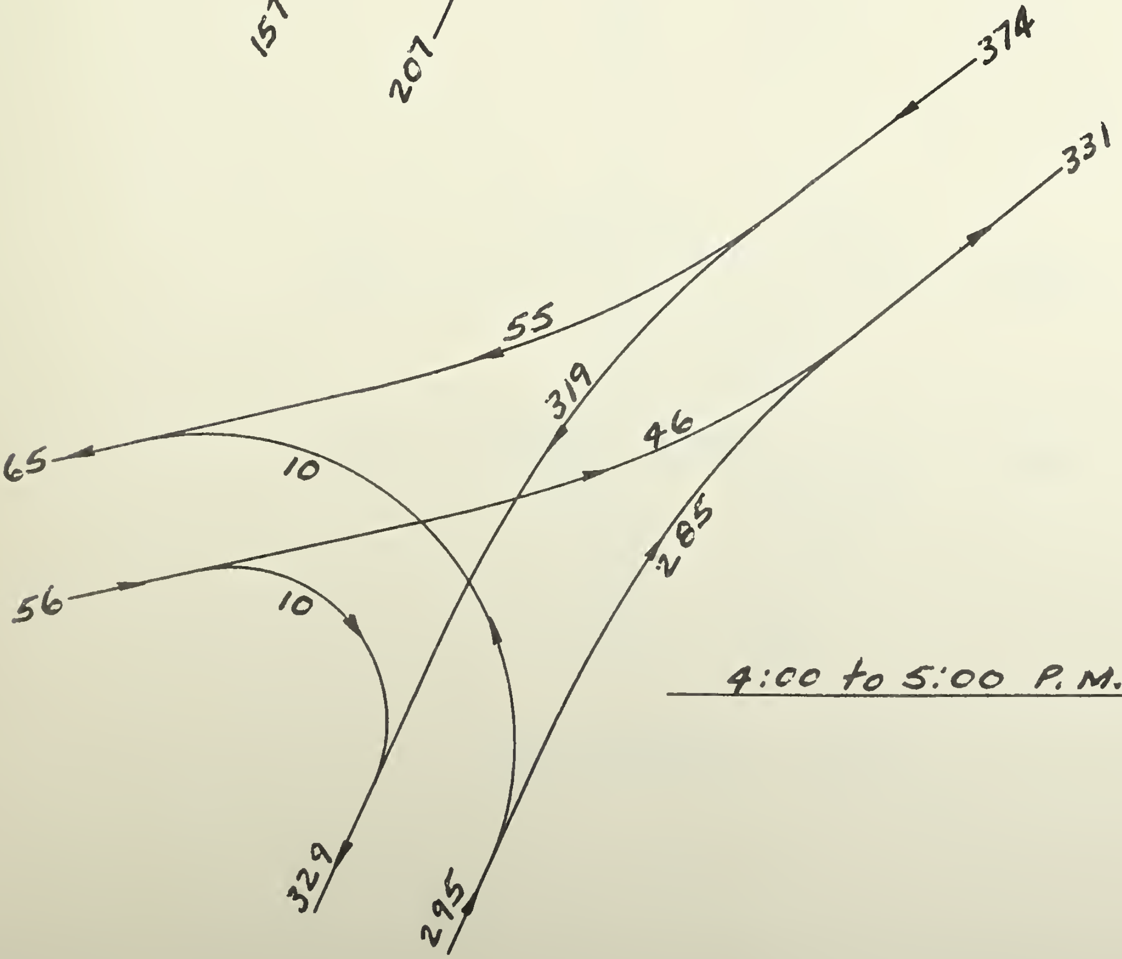


FIGURE NO. 26

Livingston
Intersection of U.S. 89 & BR. 90 ("Y")



7:45 to 8:45 A.M

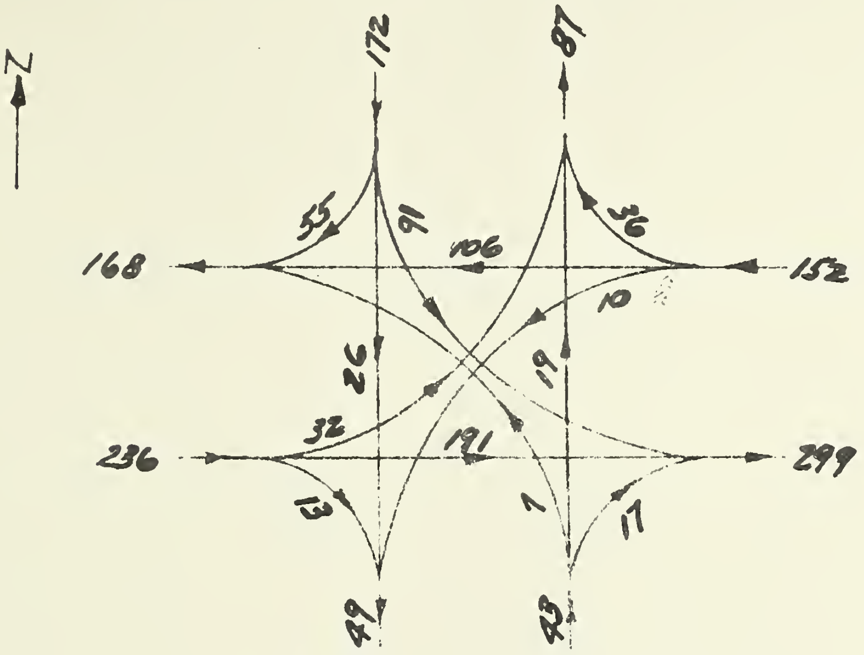


4:00 to 5:00 P.M.

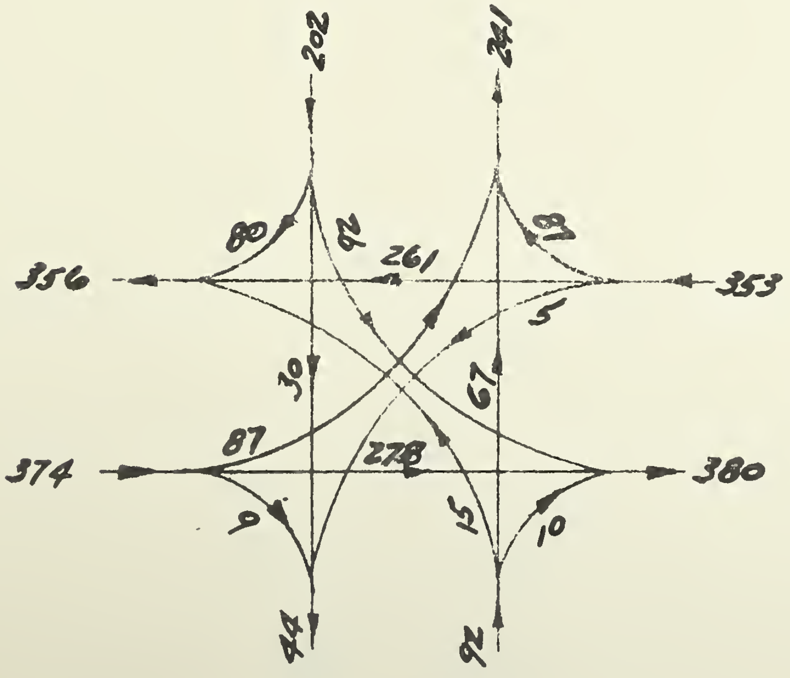
FIGURE NO. 27

LIVINGSTON

Intersection of 5th & Park



7:45 to 8:45 A.M.

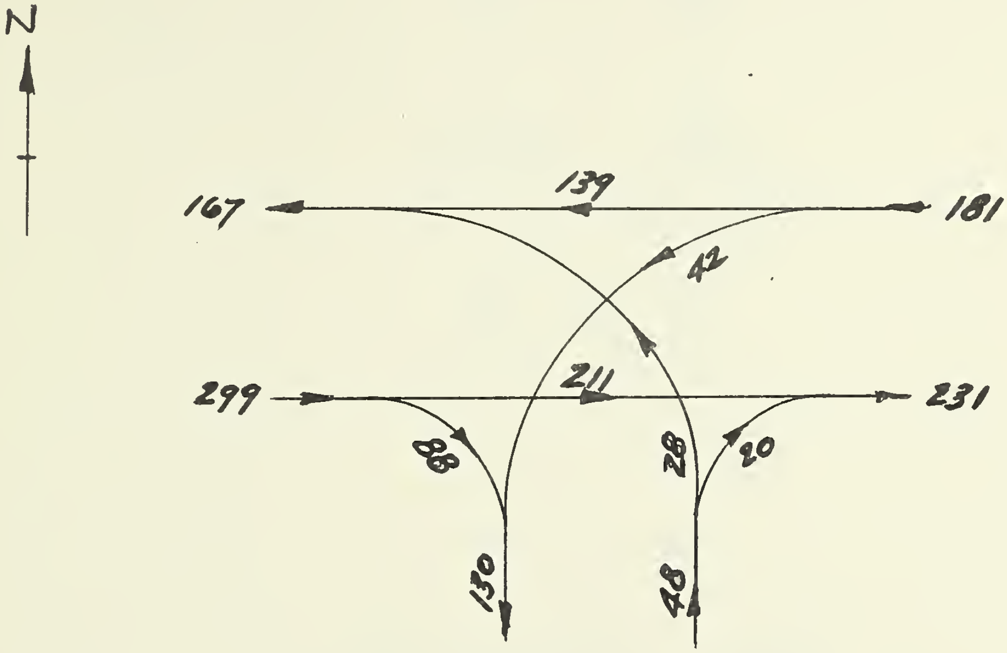


4:15 to 5:15 P.M

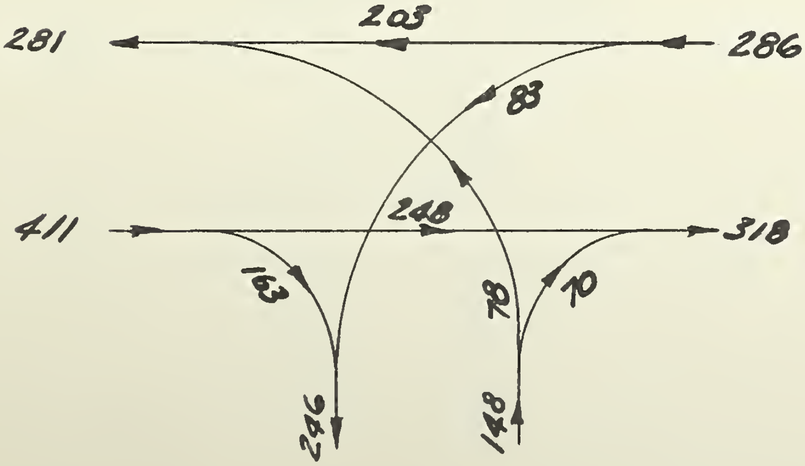
FIGURE NO. 28

LIVINGSTON

INTERSECTION: 2ND. & PARK



7:45 to 8:45 A.M.

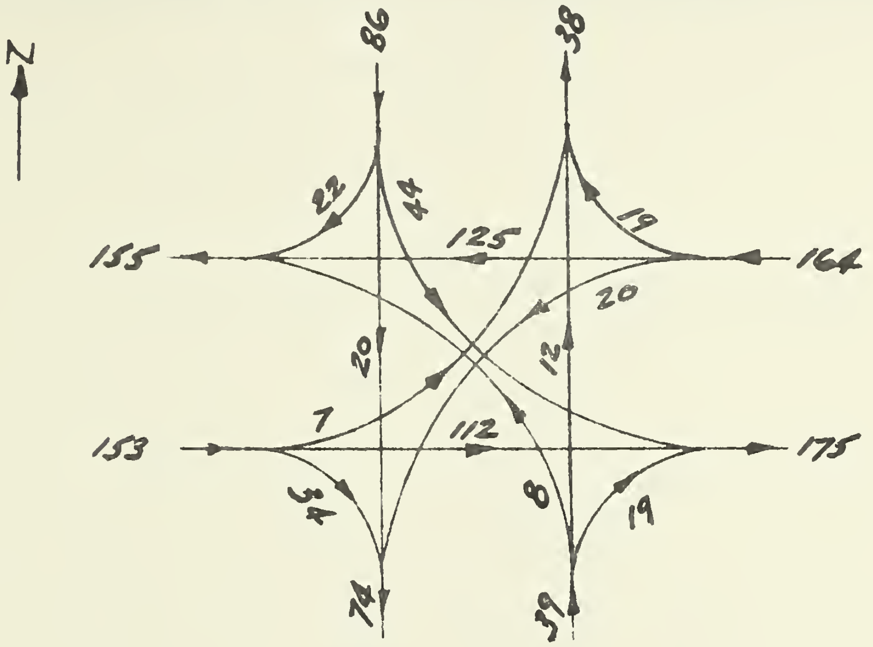


4:00 to 5:00 P.M.

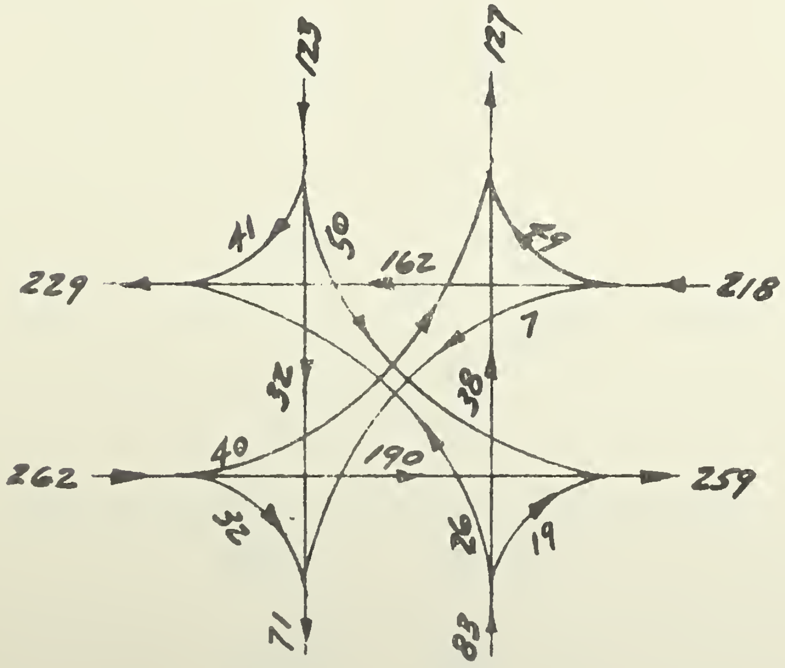
FIGURE NO. 29

LIVINGSTON

Intersection of "B" ST. & PARK



8:00 to 9:00 A.M.

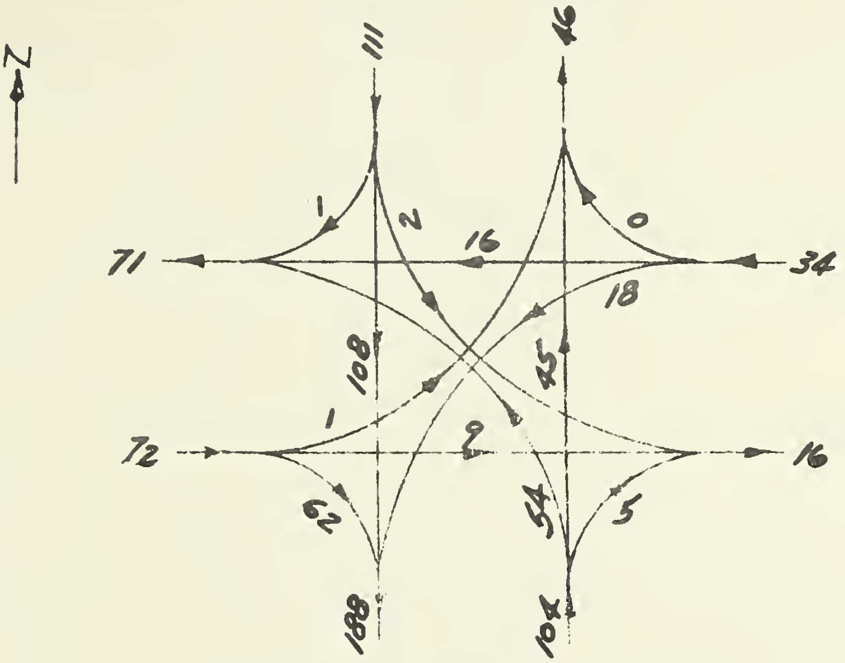


4:00 to 5:00 P.M

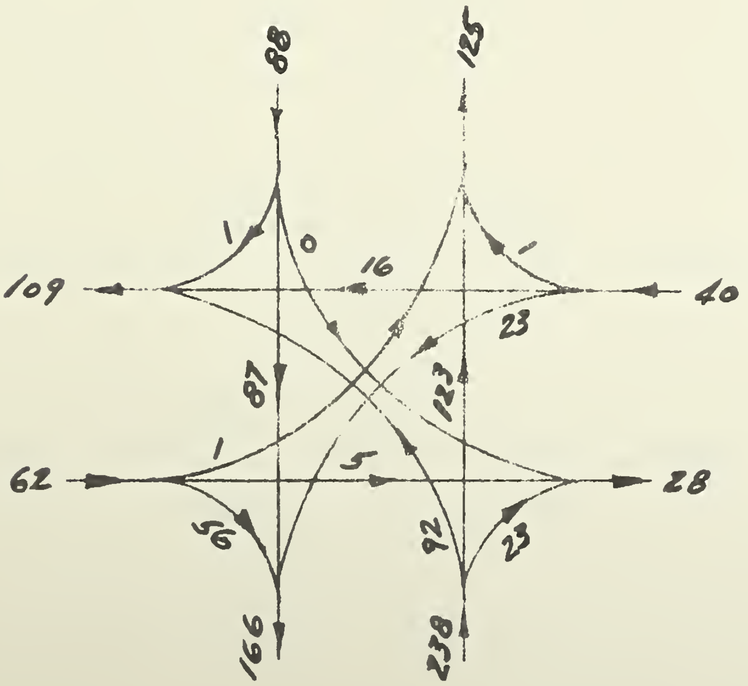
FIGURE NO. 30

LIVINGSTON

Intersection of 5th & Front



7:45 to 8:45 A.M.

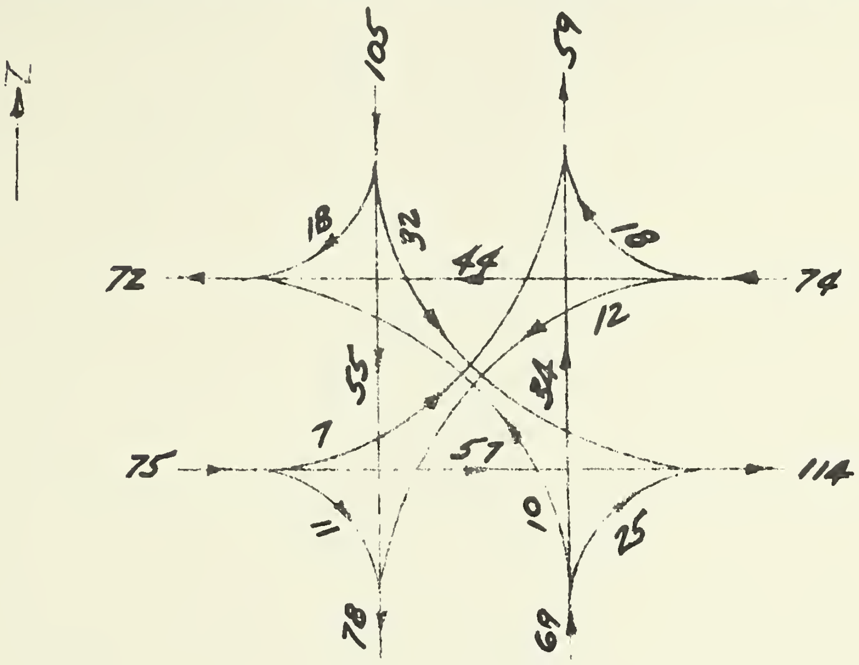


4:30 to 5:30 P.M.

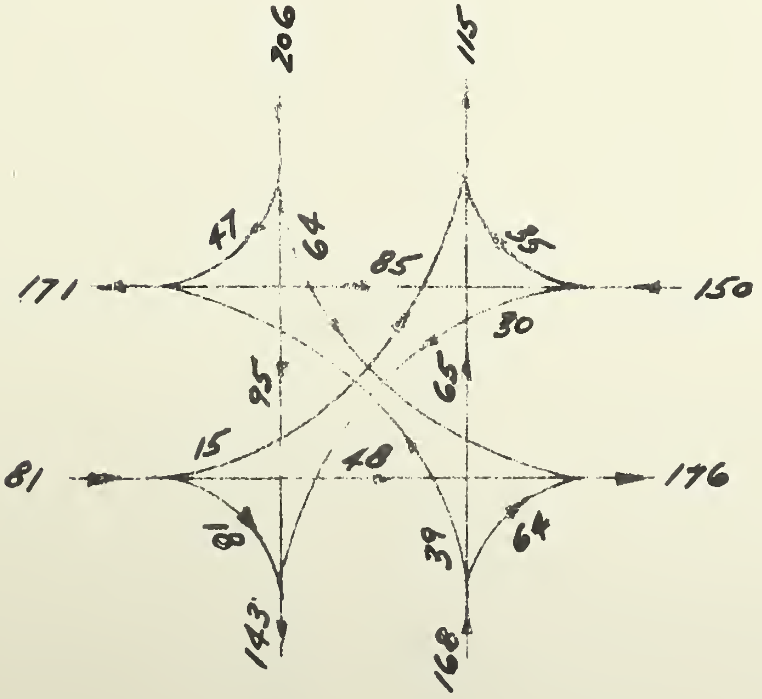
FIGURE NO. 31

LIVINGSTON

Intersection of 2ND & CALLENDER



8:00 to 9:00 A.M.

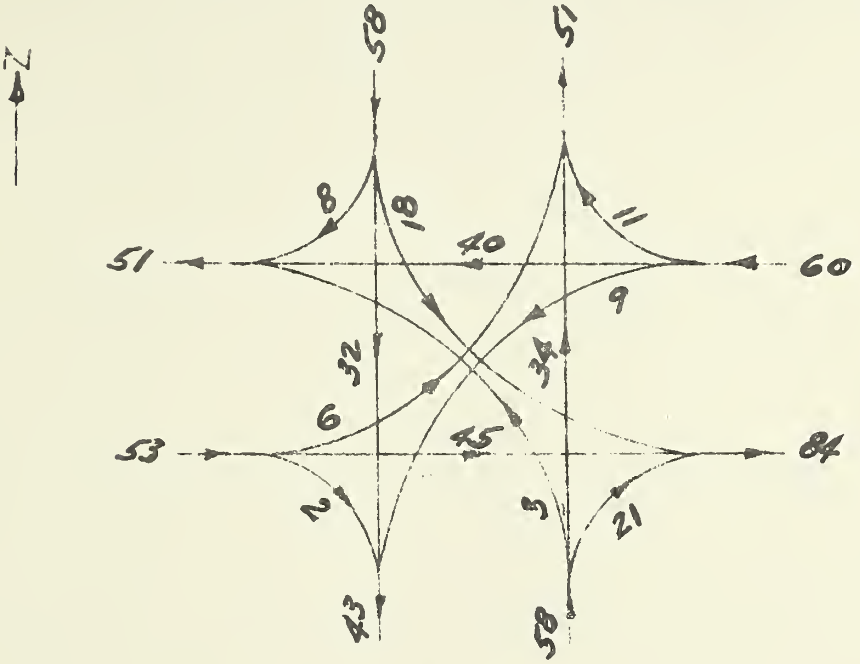


4:15 to 5:15 P.M.

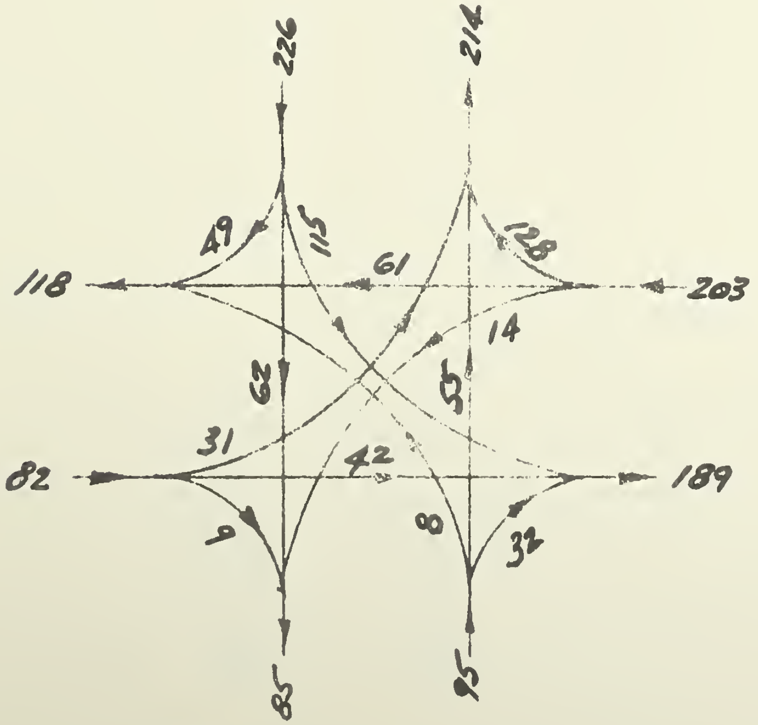
FIGURE NO. 32

LIVINGSTON

Intersection of 2ND & LEWIS



7:45 to 8:45 A.M.

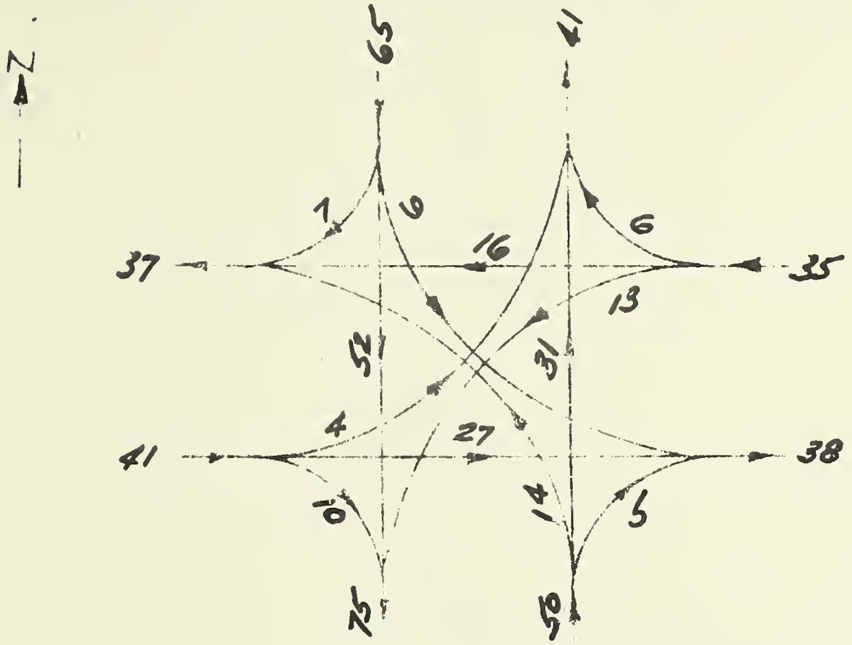


4:00 to 5:00 P.M.

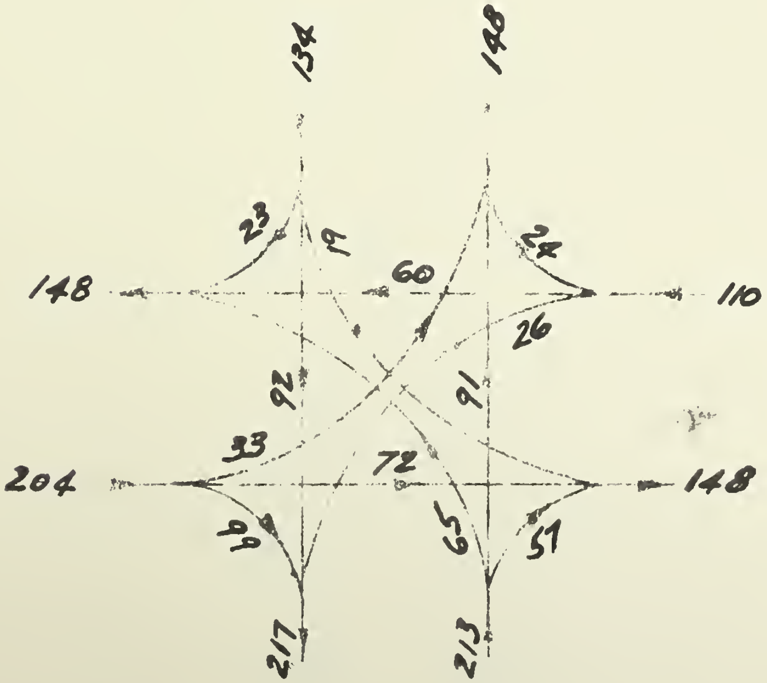
FIGURE NO. 33

LIVINGSTON

Intersection of MAIN & CALLENDER



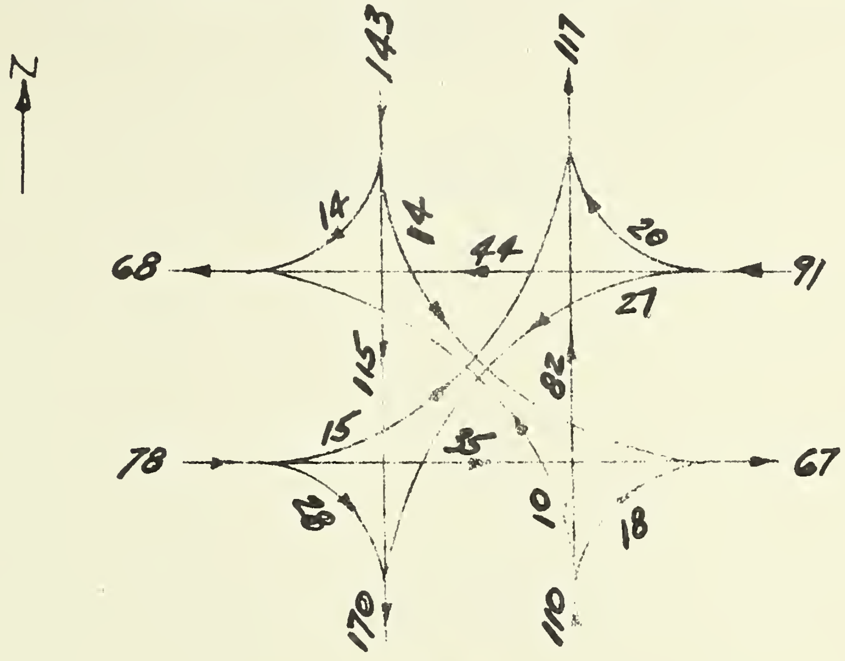
7:45 to 8:45 A.M.



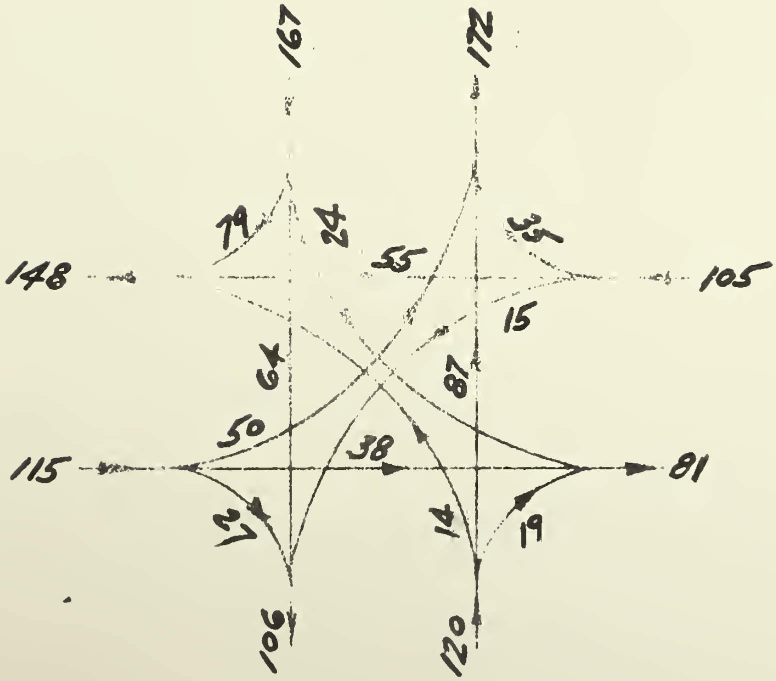
4:00 to 5:00 P.M.

FIGURE NO. 34

Intersection of LIVINGSTON MAIN & LEWIS



7:45 to 8:45 A.M.



4:00 to 5:00 P.M.

APPENDIX A

PRELIMINARY REPORT

TOPICS STUDY

CITY OF LIVINGSTON

Preliminary Report

November, 1972

Prepared by:
Menasco-McGuinn Associates
Helena, Montana

This preliminary report is a summary of Phase I of the TOPICS Study for the City of Livingston.

On August 15, 1972, a meeting was held with Mr. Tom Sharpe, Superintendent of Livingston. The purpose of this meeting was to review the intent of the TOPICS program, give an outline of the work program and time schedule, and to have general discussion as to the traffic problems of the City.

On August 22, 1972, a trip was taken to Livingston for the purpose of collecting existing data, to further discuss any specific traffic problems with Mr. Sharpe, and to get a personal feel of the traffic of the City.

A meeting with the Montana Department of Highways and the Federal Highway Administration was held at the Consultant's office on August 31, 1972. The Livingston Tentative Type II System was reviewed and approved pending approval by the City Council. On September 18, 1972, the TOPICS program was explained in detail to the Livingston City Council. Following the project introduction, the Tentative Type II System for Livingston was submitted to the City Council for approval. There were some questions on the Type II System in the north portion of town, but after explaining the purpose of TOPICS, these questions were resolved. City approval of the Type II System was received in a letter of October 31, 1972.

A field inventory of roadway lighting was conducted in Livingston on September 21, 1972. As a result of this inventory, it was determined that the existing residential lighting is below standard. However, with this inventory and further accident investigation, it does not appear that the existing residential lighting is a contributing factor in any vehicle accidents. The present lighting on Park Street and the C.B.D. is considered to be very good.

A field inventory of existing traffic control devices was conducted on September 21 and 22, 1972. As a result of this inventory, it was found that the study area would require a considerable amount of upgrading of the traffic control devices. However, the Primary I System is presently being brought up to standard in an F-9999 Project.

A field inventory of roadway elements was conducted on October 3 and 4, 1972. A detailed description for each street on the system will be given further on in this report.

The location of all the accidents in the last five years and the type that occurred in the first nine months of 1972 were investigated. The number and type of 1972 accidents will be mentioned in the description of each problem area.

A preliminary capacity analysis has been done for the six signalized intersections in the City. Present levels of service were determined for the intersections of 5th Street and Park Street, and 'B'

Street and Park Street. These levels of service will be mentioned in the intersection descriptions. At the present time, only the preliminary design capacity was determined for the remaining four intersections, which will be mentioned in the intersection descriptions.

The Tentative TOPICS System for the City of Livingston is as shown on Figure No. 1. The following is a description of the roadway elements, a list and description of problem areas on each street of the Tentative TOPICS System. Figure No. 2 is a map indicating the location of the problem areas.

On October 25, 1972, speed and delay runs were run on Main Street and Park Street. These forms are Figure No. 12 and Figure No. 13. The speed and delay runs do not indicate a substantial amount of delay. However, there is a rather low speed occurring in a two-block area in the central business district. The existing signals in this area do have a short cycle which could have something to do with the low speeds indicated by the speed and delay runs.

U. S. 89

U. S. 89 from the south urban extension boundary to interstate I-90 is a 36-foot paved roadway without curbs that is in good condition and has no apparent traffic problems. U. S. 89 has a short distance of divided roadway on each side of the interstate, and is a 45-foot roadway with good pavement and curbs with no apparent traffic problems from the north side of the interstate to the U. S. 10—Park Street junction.

U. S. 89 from the south urban extension boundary to the U. S. 10—Park Street junction is a thru street with two signalized school crossings and appears to be free flowing.

U. S. 10

U. S. 10 from the west Livingston interchange to the Park Street—U. S. 89 junction is a 34-foot paved roadway without curbs in good condition and with no apparent traffic problems except the U. S. 10—U. S. 89 and Park Street junction.

Problem Area No. 1 (U. S. 10—U. S. 89 and Park Street junction)

This minor problem area is an unsignalized ‘Y’ intersection with curbs in the center of the intersection and good pavement throughout. The thru traffic is the Park Street—U. S. 89 movement with the eastbound U. S. 10 traffic to yield. The problem appears to be the spreading out of the eastbound U. S. 10 traffic to enter Park Street, which subsequently causes some minor conjestion.

New curb channelization, signing and pavement markings are presently being proposed under an F-9999 Project.

The number of 1972 accidents was low and the intersection appears to be free flowing.

PARK STREET

Park Street between U. S. 10–U. S. 89 junction and 'B' Street varies in width from 41 feet to 50 feet. Both the pavement and the curbs are in good condition. The pavement on Park Street between 'B' Street and the Yellowstone River is in fair condition, has no curbs and varies in width from 27 feet to 49 feet. The street appears to be free flowing, although the number of 1972 accidents is relatively high at the three problem intersections: 5th and Park; 2nd and Park; and 'B' and Park.

Park Street is a thru east-west street and the existing traffic control devices do not appear to be up to present standards. However, the Park Street traffic control devices are being updated in an F-9999 Project.

Problem Area No. 2 (5th and Park intersection)

The intersection of 5th and Park is a standard intersection with pavement and curbs in good condition. It has a single overhead signal and two stop signs on 5th Street.

There is a railroad crossing on N. 5th Street which is approximately 100 feet north of the intersection of 5th Street and Park Street, and is the only at-grade railroad crossing to the north side of the City. The only other railroad crossing is an underpass on Main Street, which is used as an emergency crossing. However, this underpass is not always accessible. When there is a heavy rain, flooding occurs. This situation was brought up by the City Council and the question was asked if an overpass could be built on 5th Street with TOPICS money. The construction of the overpass in this case is felt to be beyond the scope of the TOPICS program; even though an overpass appears to be justified for other reasons. The blocking of North 5th Street by a train is of vital concern to many people who live on the north side, because school children, who are going home for lunch, have been observed crawling under a train on 5th Street on numerous occasions. It is also noted that recently an occupant in an ambulance in route to a hospital died while waiting for a train blocking 5th Street.

The 5th Street crossing, when used by the railroad, does cause a back-up of vehicles on Park Street that would be turning onto North 5th Street. The three accidents in 1972 do not appear to consistantly happen in any specific movement and the preliminary capacity analysis indicates that this intersection is presently operating at a level of service 'C'.

New signals and pavement markings for the intersection of 5th Street and Park are presently being proposed for construction under an F-9999 Project.

Problem Area No. 3 ('B' Street and Park Street intersection)

The intersection of 'B' Street and Park Street is a standard intersection with pavement and curbs in good condition. It has a single overhead signal and the preliminary capacity analysis indicates that this intersection is presently operating at a level of service 'C', and the two 1972 accidents do not appear to be a problem. The existing handrail on Park Street does restrict the sight distance on 'B' Street. However, the removal of a portion of this handrail along with new signals and pavement markings is being proposed under an F-9999 Project.

Problem Area No. 4 (2nd Street and Park Street intersection)

The intersection of 2nd Street and Park Street is a 'T' intersection with pavement and curbs in good condition. The thru traffic is on Park Street with the traffic on 2nd Street being stopped. The 24-inch stop sign on 2nd Street does not appear to be adequate, as two of four accidents in 1972 were failure-to-stop violations. The intersection appears to be free flowing.

5th STREET

North 5th Street between Park Street and Chinook Street is 38-feet wide with pavement and curbs in fair condition. The existing traffic signs do not appear to be up to present standards.

South 5th Street between Park Street and Geyser Street is 38-feet wide with pavement and curbs in fair to good condition. The existing traffic control devices, including the overhead flasher at 5th and Callender, do not appear to be up to present standards.

The number of accidents on 5th Street is low, except at the intersection of 5th and Front Street (see description of Problem No. 5), and the intersection of 5th and Park Street (see description of Problem Area No. 2).

5th Street between Chinook Street and Geyser Street is signed as a thru street except at the intersections of 5th and Park, and 5th and Callender which are signalized, and 5th and Lewis which is a four-way stop situation. Although 5th Street has two problem intersections, it still appears to be free flowing.

Problem Area No. 5 (5th Street and Front Street intersection)

The intersection of 5th and Front Street is a typical intersection with 5th Street having the thru traffic and front street being stopped. In the first nine months of 1972, there were five accidents at this intersection. Two of these accidents were caused by vehicles making left turns from the south leg of the intersection. This intersection appears to be free flowing.

STAR ROAD

Star Road, from the north urban extension boundary to Front Street, is 20 feet wide with no curbs and the pavement is in fair condition. This road appears to be free flowing, although the existing traffic signs do not appear to be up to present standards.

FRONT STREET

Front Street, between Star Road and 5th Street, varies in width from 19 feet to 34 feet. The pavement is fair to poor. The street appears to be free flowing, although the existing traffic signs do not appear to be up to present standards.

NORTH 7th STREET

North 7th Street varies in width from 27 feet to 38 feet. The pavement is in fair condition and the curbs are intermittent. The street appears to be free flowing, although the existing traffic signs do not appear to be up to standard.

MONTANA STREET

The pavement on Montana Street is in fair condition and varies in width from 32 feet to 38 feet. There are no curbs from 7th Street to Yellowstone Street. The curbs from Yellowstone Street to 'B' Street are in good condition. The street does appear to be free flowing, although the existing traffic signs do not appear to be up to present standards.

CHINOOK STREET

Chinook Street is 38 feet wide and the pavement and curbs are in good condition. The existing traffic signs do not appear to be up to present standards; however, the street does appear to be free flowing.

NORTH 'C' STREET

North 'C' Street, between Chinook Street and Gallatin Street, is 38 feet wide and the pavement and curbs are in good condition. The street does appear to be free flowing, although the existing traffic signs do not appear to be up to present standards.

GALLATIN STREET

Gallatin Street, between 'C' Street and 'I' Street, is 38 feet wide with the pavement and

curbs in fair condition. Gallatin Street from 'I' Street to the Gallatin Street–Park Street junction has no curbs and is 20 feet wide with the pavement in fair to poor condition. The existing traffic signs do not appear to be up to present standards; however, the street does appear to be free flowing.

GEYSER STREET

Geyser Street, between U. S. 89 and 'L' Street, is a thru street with one exception and that is at the intersection of Main and Geyser where Geyser Street is stopped. The pavement width varies from 28 feet to 38 feet. Where Geyser Street is paved, it also has curbs; however, approximately 25% of Geyser Street is gravel.

The number of accidents on Geyser Street is low, but the street does appear to be free flowing. The existing traffic signs do not appear to be up to present standards.

9th STREET

9th Street, from U. S. 89 to the south city limits, varies in width from 24 feet to 38 feet. The pavement and curbs are in fair condition. However, the south 20% is gravel with no curbs. The number of accidents on 9th Street is low and the street appears to be free flowing. The existing traffic signs do not appear to be up to present standards.

YELLOWSTONE STREET

Yellowstone Street, between Park Street and Callender Street, is 47 feet wide with the pavement and curbs in fair condition. The number of accidents is low and the street appears to be free flowing. The existing traffic signs do not appear to be up to present standards.

3rd STREET

3rd Street, between Park Street and Lewis Street, is 38 feet wide with the pavement and curbs in fair condition. The number of accidents is low and the street appears to be free flowing. However, the existing traffic signs do not appear to be up to present standards.

2nd STREET

2nd Street, between Park Street and Clark Street, is 46 feet wide with the pavement and curbs in fair condition. The number of accidents is relatively high at the intersection of Park and 2nd (see Problem Area No. 4); 2nd and Callender (see Problem Area No. 6); and 2nd and Lewis

(see Problem Area No. 7). The existing traffic control devices on 2nd Street do not appear to be up to present standards. However, the street does appear to be free flowing.

Problem Area No. 6 (2nd Street and Callender Street intersection)

The existing signals which are old and parts are difficult to obtain require a high amount of maintenance by the City. The existing signal face for the east-west traffic does not fall within the 20° angle from the centerline of the approach and one of the four 1972 accidents was a red-light violation. This intersection appears to be free flowing.

Problem Area No. 7 (2nd Street and Lewis Street intersection)

The existing signals, which are old and parts are difficult to obtain, require a high amount of maintenance by the City. The existing signal face for the east-west traffic does not fall within the 20° angle from the centerline of the approach and of the five 1972 accidents, two were left-turn from North 2nd Street. The remaining three were rear-end accidents on the east leg of the intersection. This intersection appears to be free flowing.

MAIN STREET

South Main Street, between Park Street and Geyser Street, is 56 feet wide with the pavement and curbs in fair condition. The number of accidents on Main Street is relatively low. However, there are two problem intersections on Main Street. The existing traffic control devices do not appear to be up to present standards. However, the street does appear to be free flowing.

NORTH MAIN STREET

North Main Street, between Park Street and Chinook Street, varies in width from 31 feet to 52 feet. The pavement and curbs are in good condition. The existing traffic signs do not appear to be up to present standards. However, the street does appear to be free flowing. The street does pass under the railroad and in the past, has been blocked when there were heavy rains by flooding.

Problem Area No. 8 (Main Street and Callender Street intersection)

The existing signals, which are old and parts are difficult to obtain, require a high amount of maintenance by the City. The existing signal face for the east-west traffic does not fall within the 20° angle from the centerline of the approach. This intersection appears to be free flowing.

Problem Area No. 9 (Main Street and Lewis Street intersection)

The existing signals, which are old and parts are difficult to obtain, require a high amount of maintenance by the City. The existing signal face for the east-west traffic does not fall within the 20° angle from the centerline of the approach. This intersection appears to be free flowing.

'B' STREET

'B' Street, between Park Street and Clark Street, varies in width from 38 feet to 50 feet. The pavement and curbs are in fair condition and the number of accidents is low except at the intersection of 'B' Street and Park (see Problem Area No. 3). The street appears to be free flowing, but the existing traffic signs do not appear to be up to present standards.

SOUTH 'C' STREET

South 'C' Street, between Park Street and Callender Street, is 38 feet wide with the pavement and curbs in fair condition. There were no accidents in 1972, and the street appears to be free flowing.

'H' STREET

'H' Street, between Park Street and Butte Street, is 38 feet wide with the pavement and curbs in good condition. The number of accidents is low and the street appears to be free flowing. The existing traffic signs do not appear to be up to present standards.

'L' STREET

'L' Street, between Clark Street and Geyser Street, is a 38-foot graveled street. The street appears to be free flowing. However, there were two accidents at the intersection of Clark Street and 'L' Street. There are no existing traffic signs.

CLARK STREET

Clark Street, between 'L' Street and 'M' Street, is a 38-foot graveled street. The street appears to be free flowing, but there are no existing traffic signs.

SOUTH 'M' STREET

South 'M' Street is a 38-foot gravel street, that has had no accidents in 1972. The street appears to be free flowing, but the existing traffic signs do not appear to be up to present standards.

CITY PARK ROAD

City Park Road, from Main Street to 'H' Street, is a 20-foot paved road with no curbs. The pavement is in fair to bad condition and there were no 1972 accidents. It appears to be free flowing and has no existing traffic signs.

CALLENDER STREET

Callender Street, between Yellowstone Street and 'C' Street, varies in width from 40 feet to 46 feet. The pavement and curbs are in fair condition but the existing traffic control devices do not appear to be up to present standards. It does appear to be free flowing. However, there are two problem intersections (see Problem Areas No. 6 and 8).

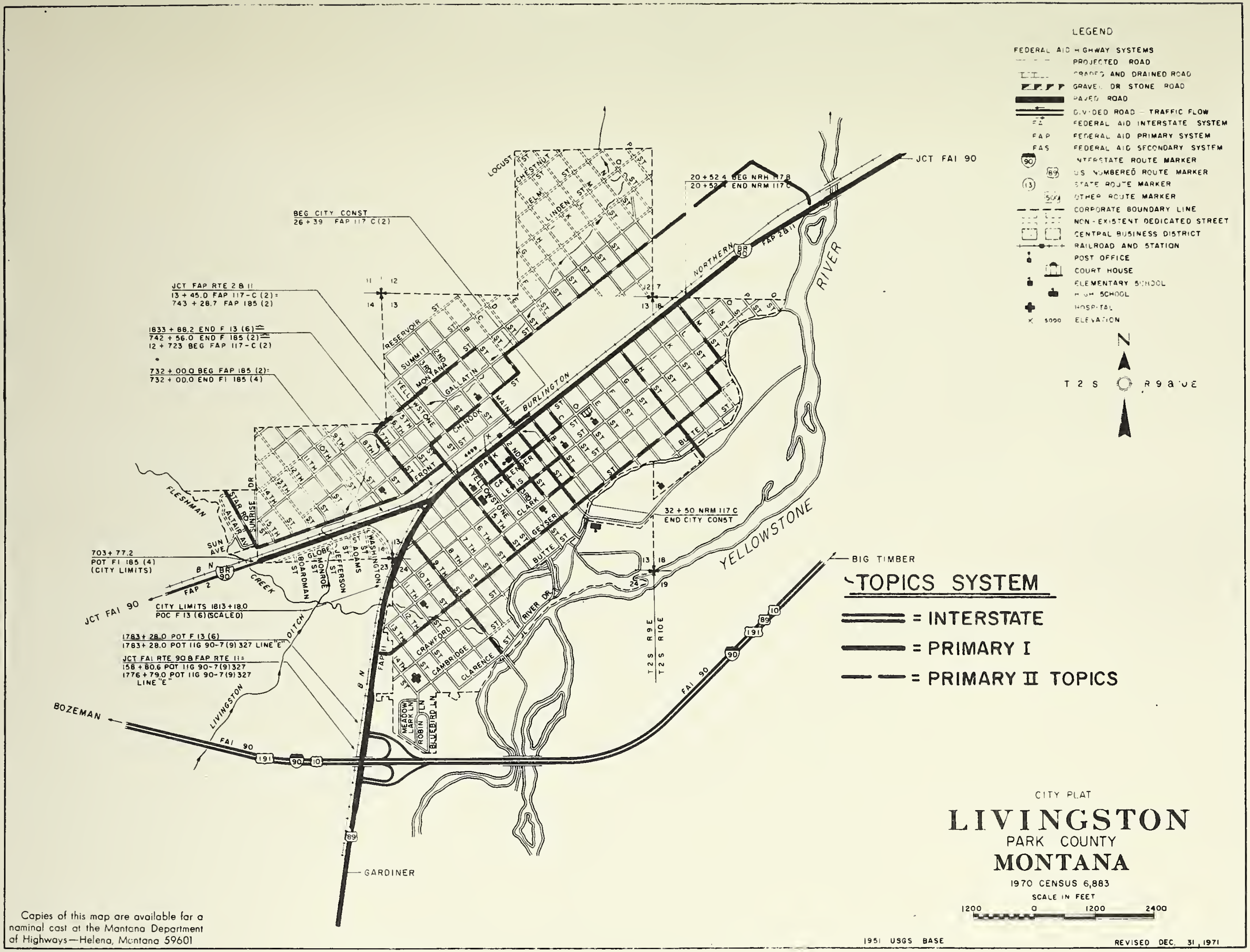
LEWIS STREET

Lewis Street, between 3rd Street and 'B' Street, varies in width from 38 feet to 50 feet. The pavement and curbs are in fair condition, but the existing traffic control devices do not appear to be up to present standards. It does appear to be free flowing. However, there are two problem intersections (see Problem Areas No. 7 and 9).

CLARK STREET

Clark Street, between 2nd Street and 'B' Street, varies in width from 38 feet to 50 feet. The pavement and curbs are in fair condition and the number of 1972 accidents is low. The existing traffic control devices do not appear to be up to present standards. However, the street does appear to be free flowing.

FIGURE NO. 1



Copies of this map are available for a nominal cost at the Montana Department of Highways—Helena, Montana 59601

FIGURE NO. 2

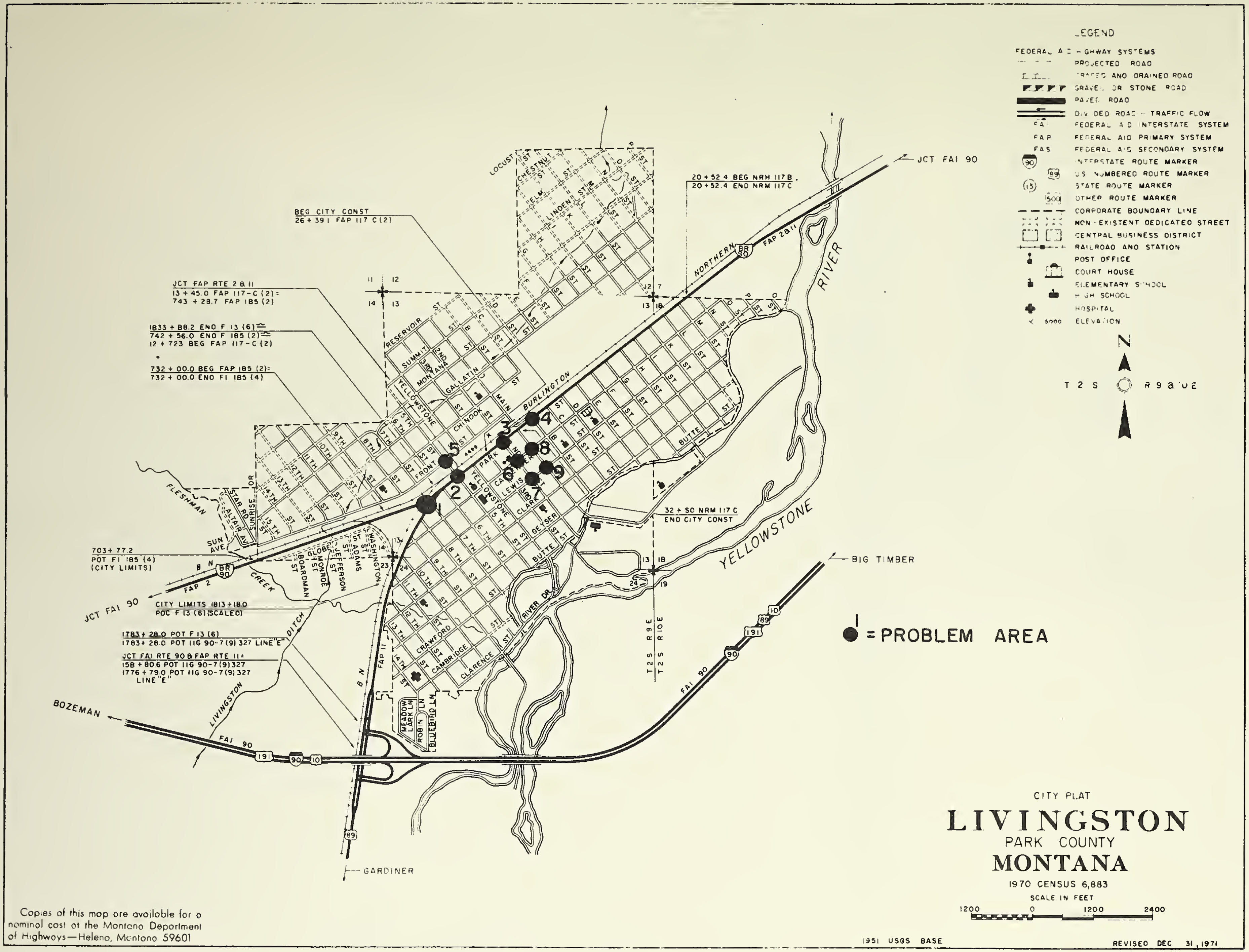

LEGEND
FEDERAL AID HIGHWAY SYSTEMS
PROJECTED ROAD
GRADED AND DRAINED ROAD
GRAVEL OR STONE ROAD
PAVED ROAD
DIVIDED ROAD – TRAFFIC FLOW
FAI FEDERAL AID INTERSTATE SYSTEM
FAP FEDERAL AID PRIMARY SYSTEM
FAS FEDERAL AID SECONDARY SYSTEM
90 INTERSTATE ROUTE MARKER
89 US NUMBERED ROUTE MARKER
13 STATE ROUTE MARKER
500 OTHER ROUTE MARKER
CORPORATE BOUNDARY LINE
NON-EXISTENT DEDICATED STREET
CENTRAL BUSINESS DISTRICT
RAILROAD AND STATION
POST OFFICE
COURT HOUSE
ELEMENTARY SCHOOL
HIGH SCHOOL
HOSPITAL
5000 ELEVATION
N
T 2 S
R 9 & 10 E
● = PROBLEM AREA
1
2
3
4
5
6
7
8
9
JCT FAI 90
20 + 52.4 BEG NRH 117 B
20 + 52.4 END NRM 117 C
BEG CITY CONST
26 + 391 FAP 117 C (2)
JCT FAP RTE 2 & 11
13 + 45.0 FAP 117-C (2) =
743 + 28.7 FAP 185 (2)
1833 + 88.2 END F 13 (6) =
742 + 56.0 END F 185 (2) =
12 + 723 BEG FAP 117-C (2)
732 + 00.0 BEG FAP 185 (2) =
732 + 00.0 END FI 185 (4)
703 + 77.2
POT FI 185 (4)
(CITY LIMITS)
CITY LIMITS 1813 + 18.0
POC F 13 (6) (SCALED)
1783 + 28.0 POT F 13 (6)
1783 + 28.0 POT IIG 90-7 (9) 327 LINE "E"
JCT FAI RTE 90 & FAP RTE 11 =
158 + 80.6 POT IIG 90-7 (9) 327
1776 + 79.0 POT IIG 90-7 (9) 327
LINE "E"
32 + 50 NRM 117 C
END CITY CONST
NORTHERN
BURLINGTON
FAP 2 & 11
FAP 2
FAP 11
B N
BR 90
FAI 90
90
191
10
89
YELLOWSTONE
RIVER
FLESHMAN
CREEK
LIVINGSTON
DITCH
BIG TIMBER
BOZEMAN
GARDINER
JCT FAI 90
T2S R9E
T2S R10E
LOCUST ST
CHESTNUT ST
ELM
LINDEN
RESERVOIR ST
SUMMIT
MONTANA
GALLATIN
CHINOOK ST
MAIN ST
PARK
YELLOWSTONE
CALLENDER
LEWIS
CLARK
GEYSER ST
BUTTE ST
FRONT ST
RIVER DR
CRAWFORD ST
CAMBRIDGE ST
CLARENCE ST
MEADOW LARK LN
ROBIN LN
BLUEBIRD LN
WASHINGTON ST
ADAMS ST
JEFFERSON ST
MONROE ST
BOARDMAN ST
GLOBE
SUN AVE
ALTAIR AV
STAR RD
SUNRISE DR
CITY PLAT
LIVINGSTON
PARK COUNTY
MONTANA
1970 CENSUS 6,883
SCALE IN FEET
1200 0 1200 2400
1951 USGS BASE
REVISED DEC 31, 1971
Copies of this map are available for a nominal cost at the Montana Department of Highways—Helena, Montana 59601

Figure No. 3

Problem Area No. 1

Intersection of Jct. U.S. 10, U.S. 89 and Park Street

EXISTING CONDITIONS

(1) Typical Section: Paved (U.S. 89, Curb & Gutter)
(2) Signals: None
(3) Signing: Yield
(4) Pavement Markings: None, except centerline
(5) No. of 1972 Accidents: 1 (Jan. 1 to Sept. 30)

REMARKS

The minor problem of this intersection appears that the eastbound vehicles from U. S. 10 spread out to get onto Park Street; subsequently causing some conjestion. New curb channelization, signing and pavement markings are presently being proposed under an F-9999 Project.

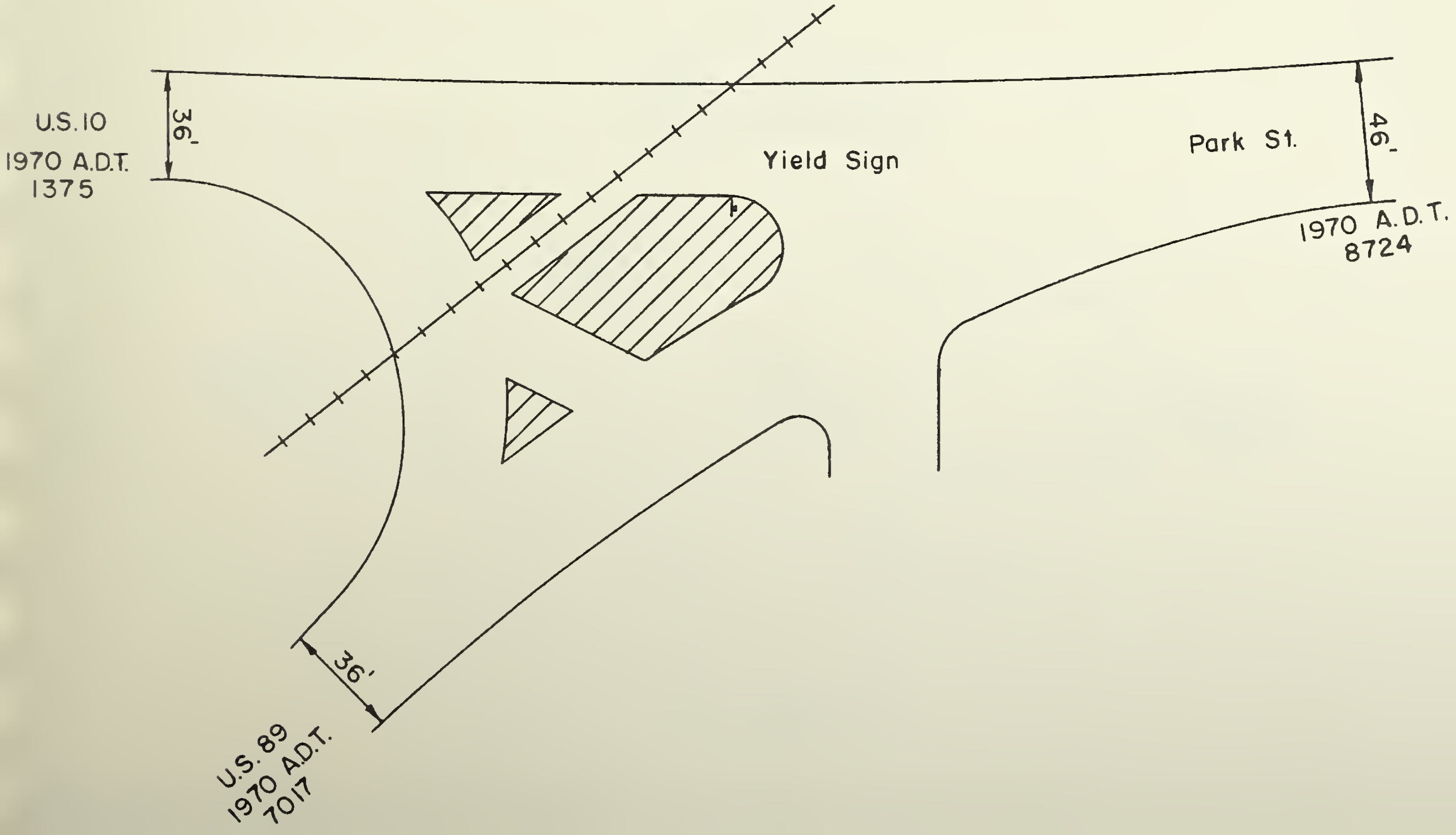


Figure No. 4

Problem Area No. 2

Intersection of 5th Street & Park Street

EXISTING CONDITIONS

(1) Typical Section: Paved, Curb & Gutter
(2) Signals: 1, Overhead, Single-face
(3) Signing: 2 Stop Signs on 5th Street
(4) Pavement Markings: Centerlines
(5) No. of 1972 Accidents: 3 (Jan. 1 to Sept. 30)

REMARKS

There is a railroad crossing on 5th Street, approximately 100 feet north of the intersection. When a train is blocking 5th Street, it causes a backup of vehicles that would be turning from Park Street to North 5th Street. The three accidents in 1972 do not appear to happen consistently in any specific movement and the preliminary capacity analysis indicates that this intersection is presently operating at a level of service 'C'.

New signals and pavement markings are presently being proposed for construction in an F-9999 Project.

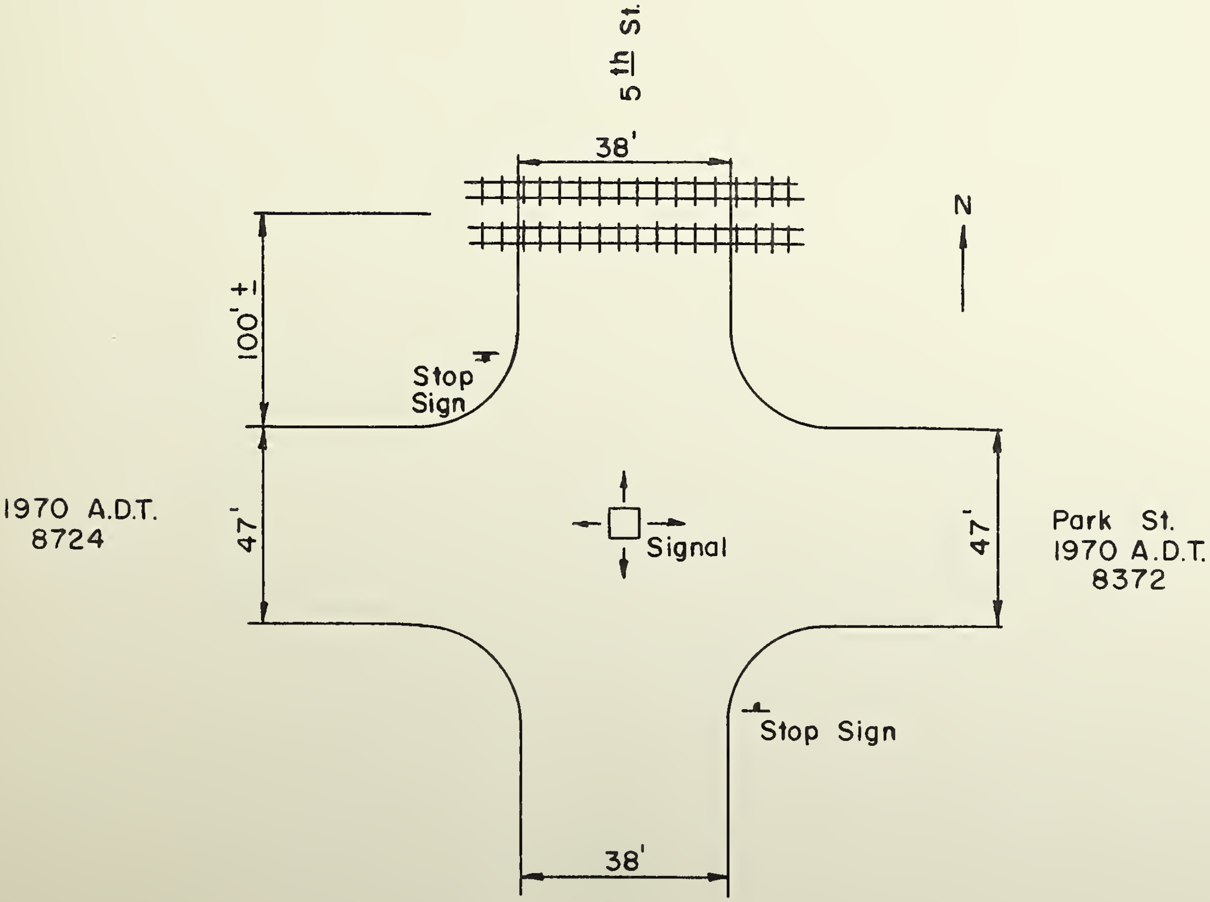


Figure No. 5

Problem Area No. 3

Intersection of 'B' Street & Park Street

EXISTING CONDITIONS

(1) Typical Section: Paved, Curb & Gutter
(2) Signals: 1, Overhead, Single-face
(3) Signing: None
(4) Pavement Markings: Centerline
(5) No. of 1972 Accidents: 2 (Jan. 1 to Sept. 30)

REMARKS

The preliminary capacity analysis indicates that this intersection is presently operating at a level of service 'C' and the 1972 accidents do not appear to be a problem. The existing handrail on Park Street does restrict the sight distance for 'B' Street. However, the removal of a portion of this handrail along with new signals and pavement markings is being proposed under an F-9999 Project.

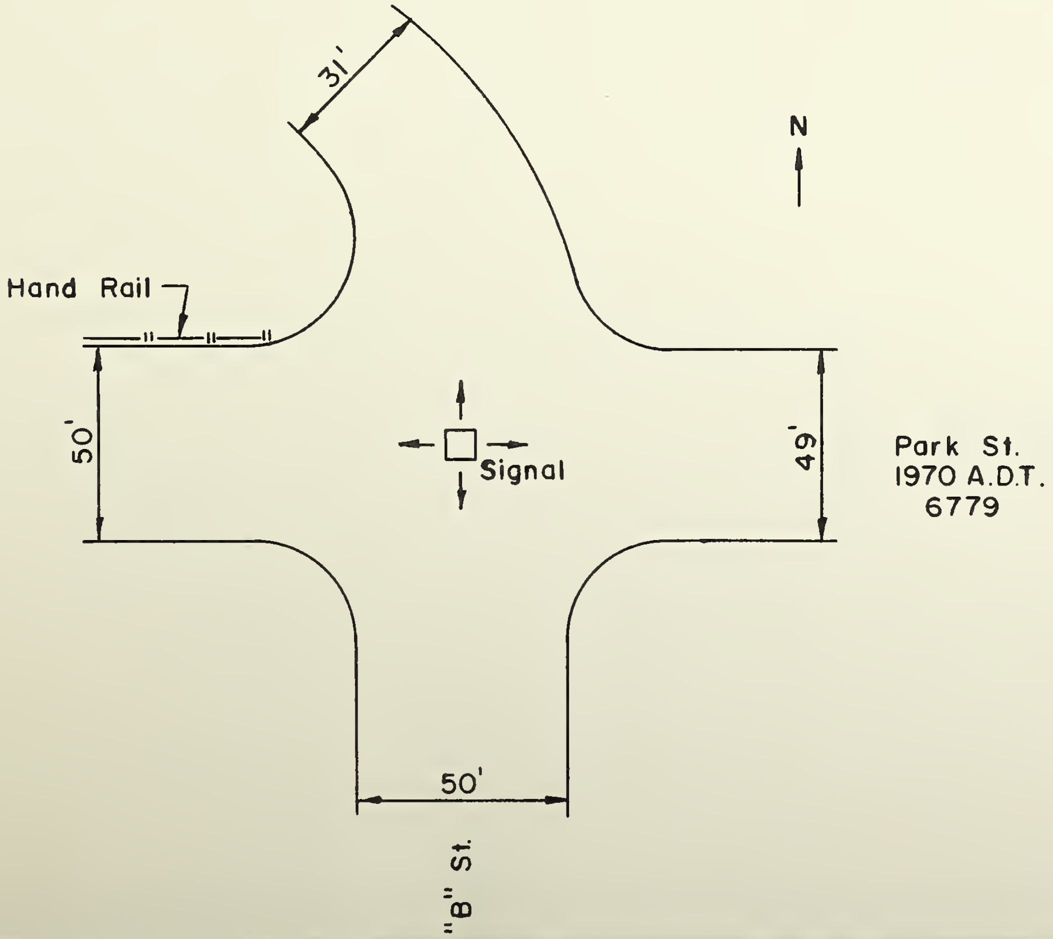


Figure No. 6

Problem Area No. 4

Intersection of 2nd Street & Park Street

EXISTING CONDITIONS

(1) Typical Section: Paved, Curb & Gutter
(2) Signals: None
(3) Signing: Stop Sign on 2nd
(4) Pavement Markings: Centerline
(5) No. of 1972 Accidents: 4 (Jan. 1 to Sept. 30)

REMARKS

In the first nine months of 1972, there were four accidents at this intersection. Two of these accidents were apparently caused by vehicles on 2nd Street not coming to a full stop. This intersection appears to be free flowing.

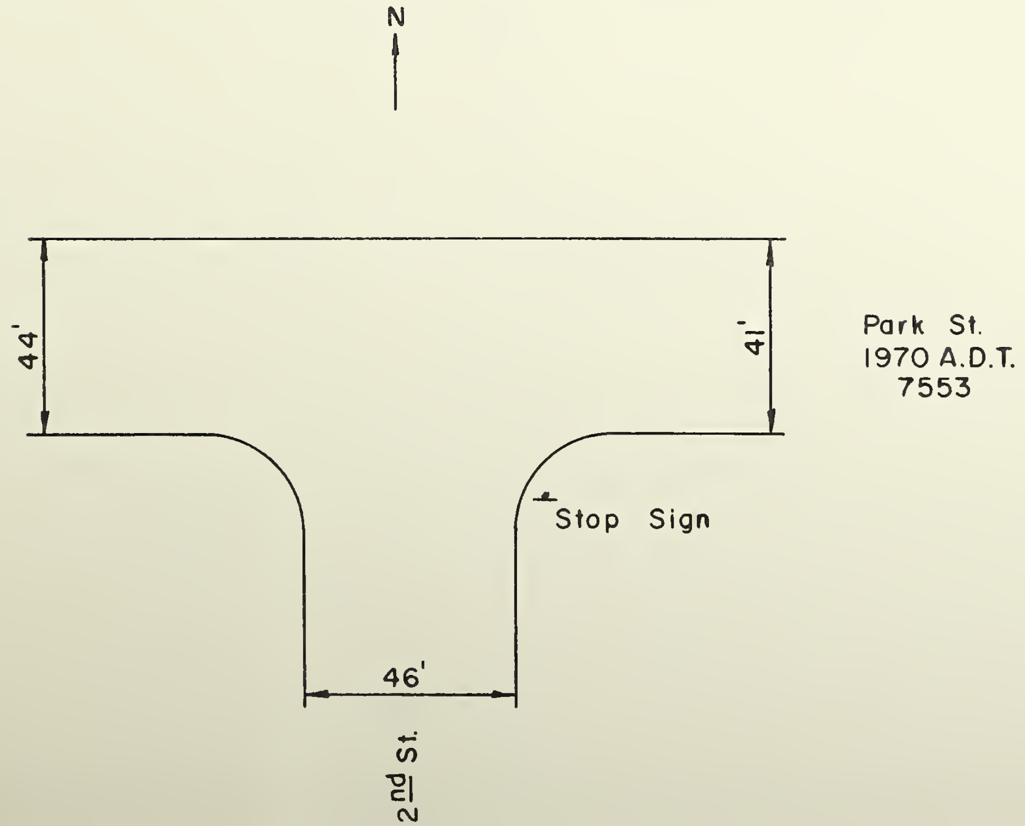


Figure No. 7

Problem Area No. 5

Intersection of 5th Street & Front Street

EXISTING CONDITIONS

(1) Typical Section: Paved, Curb & Gutter
(2) Signals: None
(3) Signing: 2 Stop Signs on Front Street
(4) Pavement Markings: Centerline
(5) No. of 1972 Accidents: 5 (Jan. 1 to Sept. 30)

REMARKS

In the first nine months of 1972, there were five accidents at this intersection. Two of these accidents were caused by vehicles making a left turn from the south leg of the intersection. This intersection appears to be free flowing.

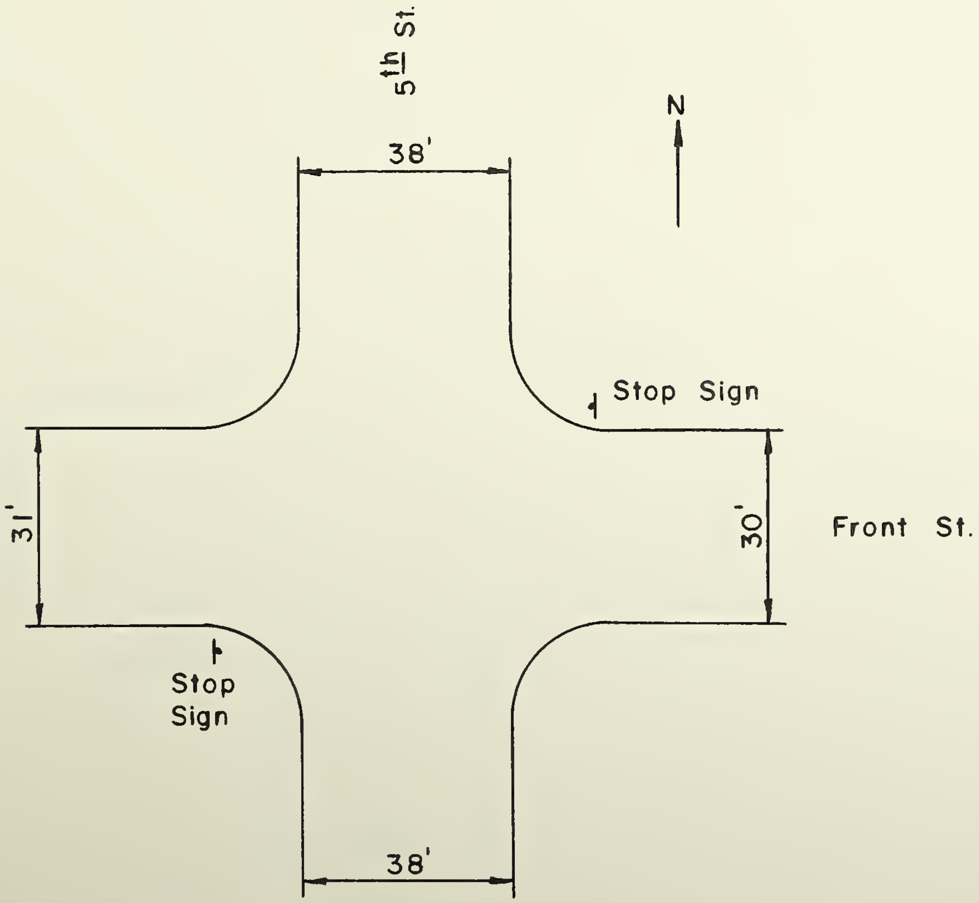


Figure No. 8

Problem Area No. 6

Intersection of 2nd Street & Callender Street

EXISTING CONDITIONS

(1) Typical Section: Paved, Curb & Gutter
(2) Signals: 2, post-mounted, single-face (old)
(3) Signing: None
(4) Pavement Markings: Centerline
(5) No. of 1972 Accidents: 4 (Jan. 1 to Sept. 30)

REMARKS

The existing signals, which are old and parts are difficult to obtain, require a high amount of maintenance by the City. The existing signal face for the east-west traffic does not fall within the 20° angle from the centerline of the approach. One of the four 1972 accidents was a red light violation. This intersection appears to be free flowing.

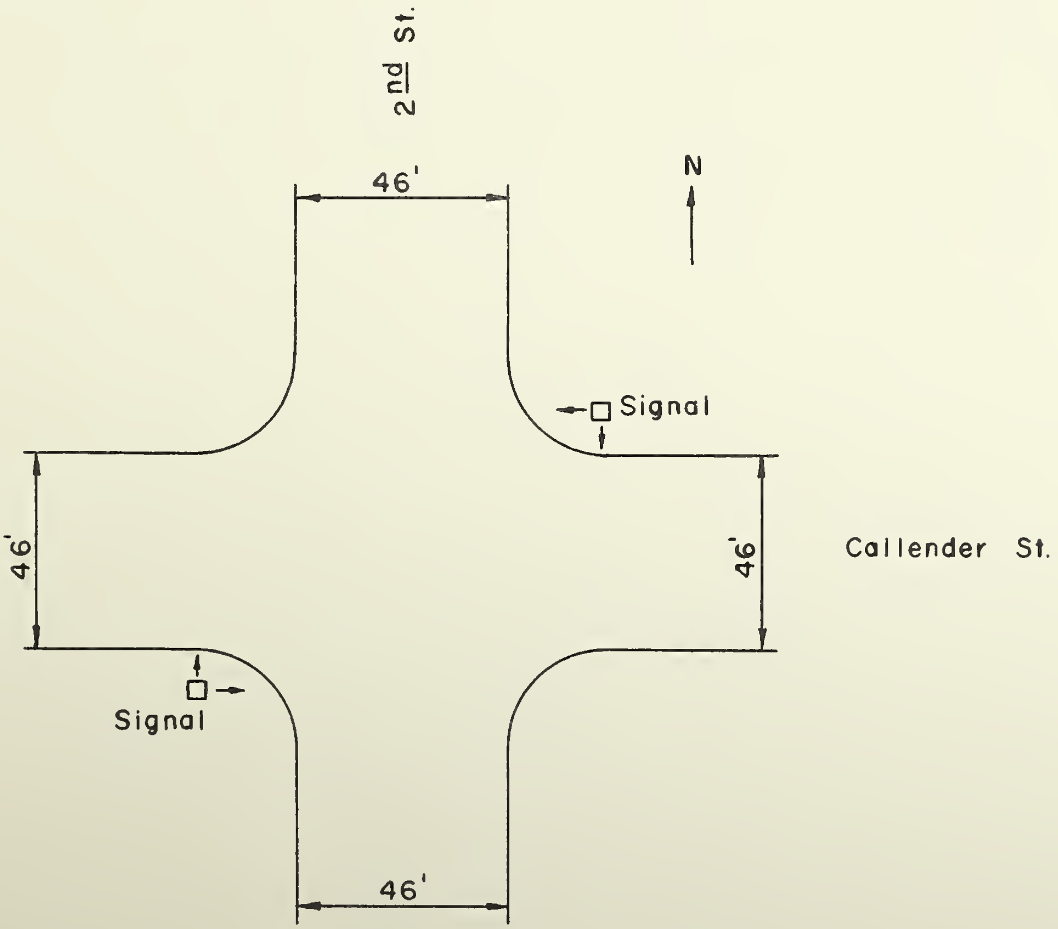


Figure No. 9

Problem Area No. 7

Intersection of 2nd Street & Lewis Street

EXISTING CONDITIONS

(1) Typical Section: Paved, Curb & Gutter
(2) Signals: 2, post-mounted, single-face (old)
(3) Signing: None
(4) Pavement Markings: Centerline
(5) No. of 1972 Accidents: 5 (Jan. 1 to Sept. 30)

REMARKS

The existing signals, which are old and parts are hard to obtain, require a high amount of maintenance by the City. The existing signal face for the east-west traffic does not fall within the 20° angle from the centerline of the approach. Of the five 1972 accidents, two were left turn from North 2nd and three were rear-end on the east leg of the intersection. This intersection appears to be free flowing.

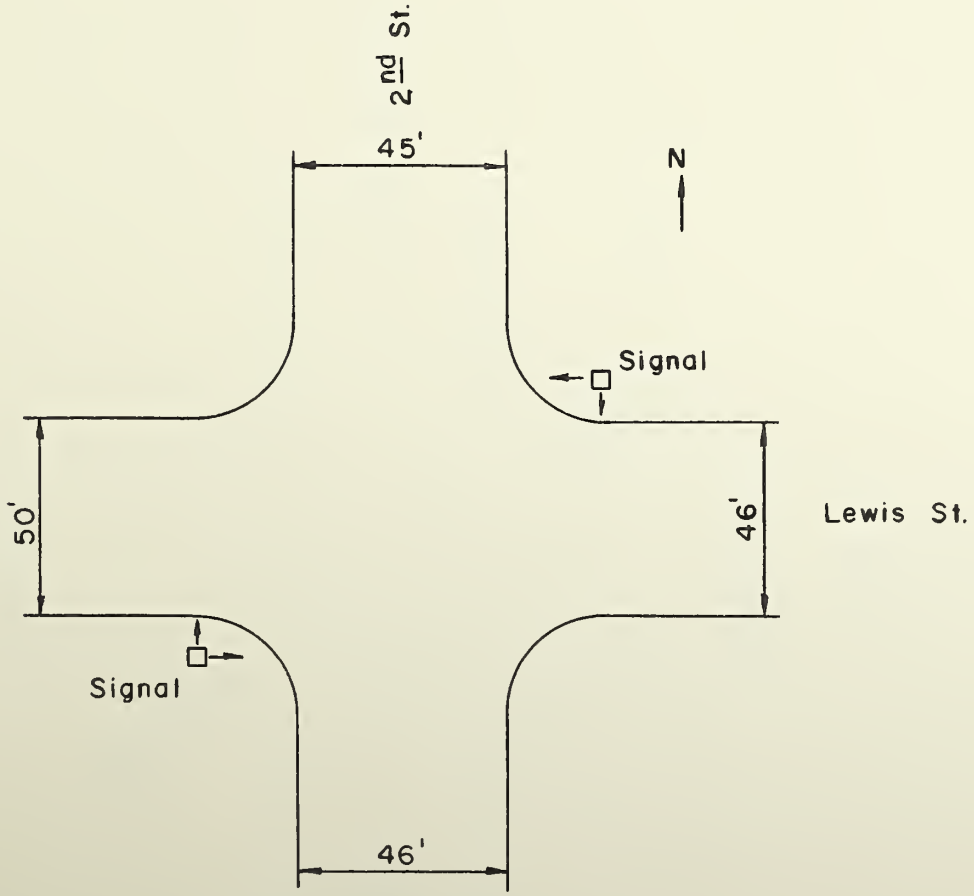


Figure No. 10

Problem Area No. 8

Intersection of Callender Street & Main Street

EXISTING CONDITIONS

(1) Typical Section: Paved, Curb & Gutter
(2) Signals: 2, post-mounted, single-face (old)
(3) Signing: None
(4) Pavement Markings: Centerline
(5) No. of 1972 Accidents: 2 (Jan. 1 to Sept. 30)

REMARKS

The existing signals, which are old and parts are difficult to obtain, require a high amount of maintenance by the City. The existing signal face for the east-west traffic does not fall within the 20° angle from the centerline of the approach. This intersection appears to be free flowing.

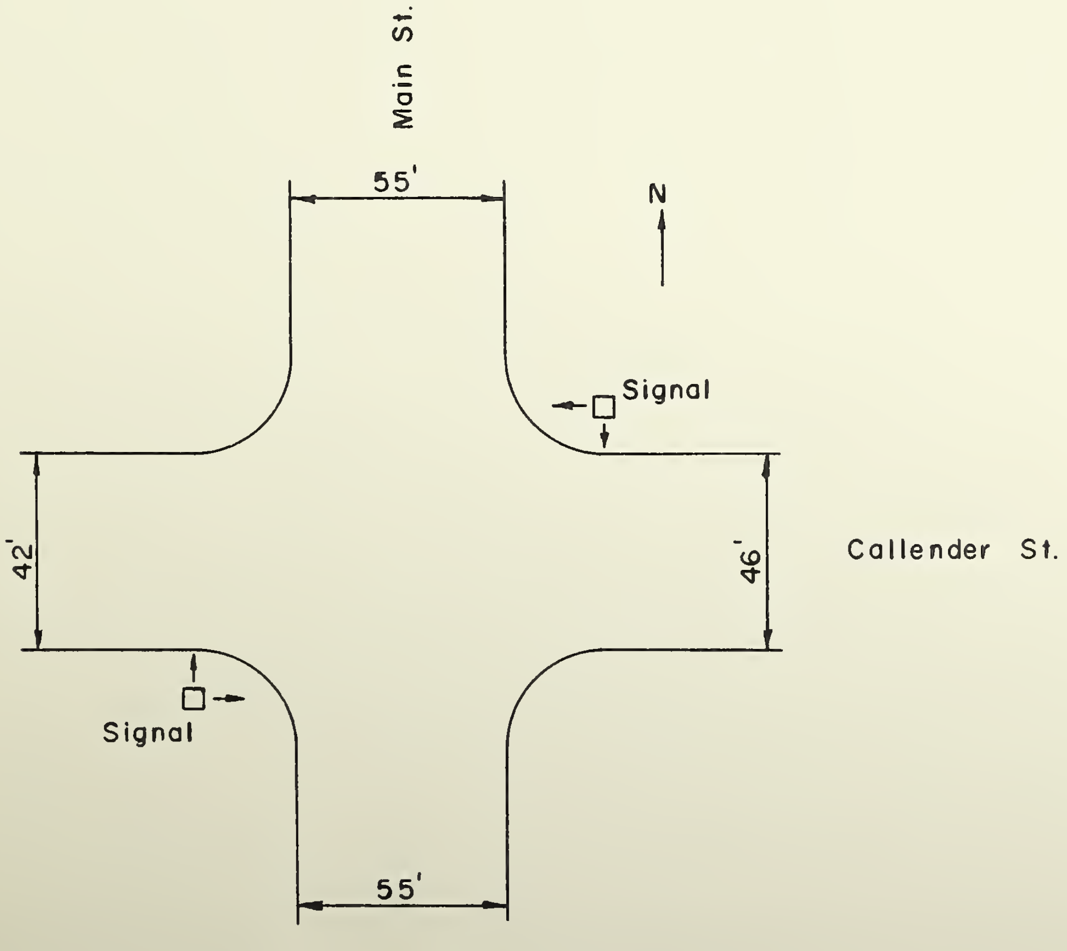


Figure No. 11

Problem Area No. 9

Intersection of Lewis Street & Main Street

EXISTING CONDITIONS

(1) Typical Section: Paved, Curb & Gutter
(2) Signals: 2, post-mounted, single-face (old)
(3) Signing: None
(4) Pavement Markings: Centerline
(5) No. of 1972 Accidents: 2 (Jan. 1 to Sept. 30)

REMARKS

The existing signals, which are old and parts are difficult to obtain, require a high amount of maintenance by the City. The existing signal face for east-west traffic does not fall within the 20° angle from the centerline of the approach. This intersection appears to be free flowing.

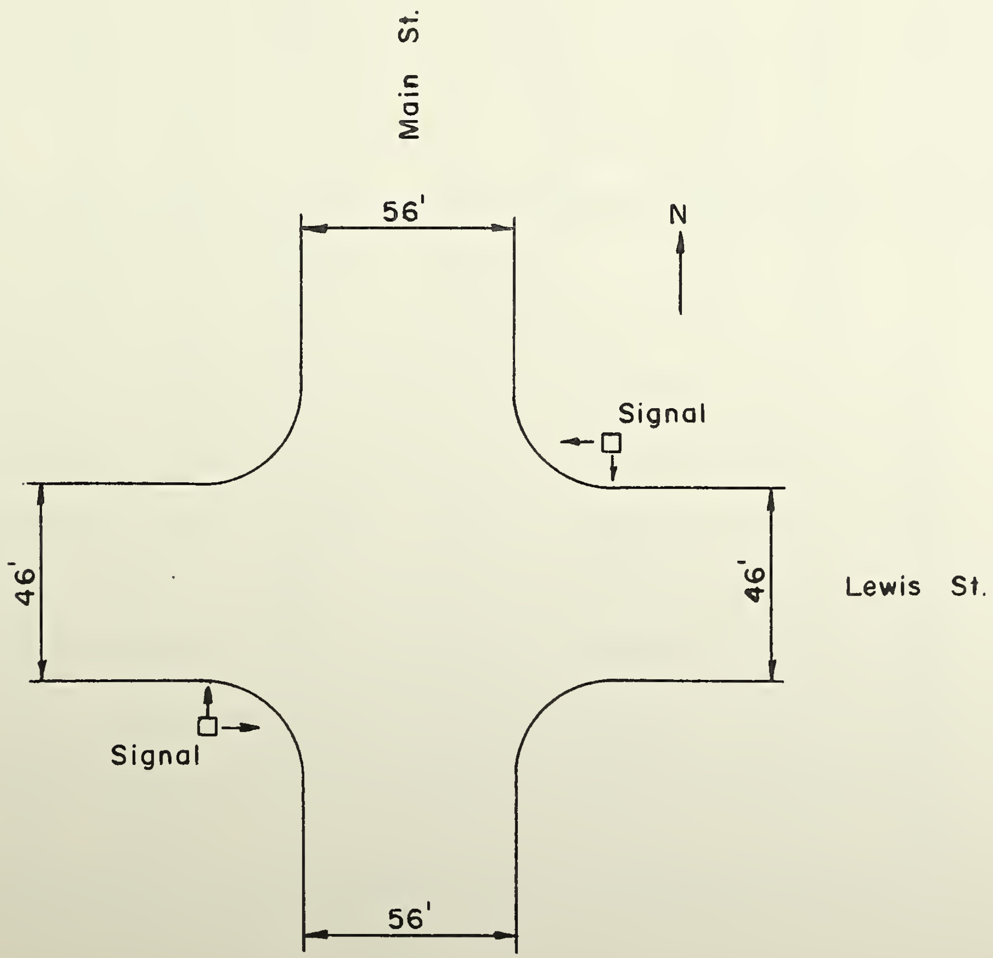


Figure No. 12

Livingston No. 1

MONTANA HIGHWAY PLANNING SURVEY

Field Form for Travel Time Study

On: Main & Park **Weather:** Warm & Dry **Date:** 10-4&10-25 1972 **Recorder** BW

Between ____ **and** ____ **Direction** North & West

Control Point ⇨	Start 1	2	3	4	Check	5				Check
Hr. Dist. & Date	0.00	0.10	0.15	0.45		0.75				
12:50 pm 10-4-72	0	0.30	1.00	1.13	0.77	2.90				
12:57 pm 10-4-72	0	0.33	0.68	1.50	0.40	2.17				
3:50 pm 10-25-72	0	0.83	1.52	2.70	0.60	3.60				
4:00 pm 10-25-72	0	0.38	0.90	1.90		2.58				
4:50 pm 10-25-72	0	0.37	0.90	1.73	0.17	2.47				
4:55 pm 10-25-72	0	0.77	1.17	2.42	0.52	3.18				
			Total	11.38					Total	
Extra Runs			Average	1.90					Average	
5:15 pm 10-25-72	0	0.62	1.05	1.85		2.55				
5:25 pm 10-25-72	0	0.93	1.75	2.53		3.32				
Total	0	4.53	8.97	15.76		22.77				
Average	0	0.57	1.12	1.97		2.85				

Travel Time	0.57	0.55	0.85	0.88			
Length	0.10	0.05	0.30	0.30			
Speed	10.5	5.45	21.2	20.5			
Rate of Motion							
Standard Rate							
Delay Rate							
Volume							
Vehicle Delay Rate							

Figure No. 13

Livingston No. 2

MONTANA HIGHWAY PLANNING SURVEY

Field Form for Travel Time Study

On: Main & Park **Weather:** Clear & Warm **Date:** 10-25-72 **Recorder** BW

Between Lewis Street **and** 'E' Street **Direction** North & East

Control Point ⇨	Start 1	2	3	4	Check	5				Check
Hr. & Date \ Dist.	0.00	0.10	0.15	0.20		0.40				
10-25-72 4:05 pm	0	0.70	1.50	1.77	0.22	2.35				
4:10 pm	0	0.35	0.72	0.93	.57	1.48				
4:15 pm	0	0.70	1.02	1.68	.18	2.27				
5:05 pm	0	0.50	0.97	1.63	.13	2.18				
5:10 pm	0	0.33	1.23	2.00	.50	2.62				
5:20 pm	0	0.35	0.80	1.02	.48	1.57				
			Total	9.03				Total		
Extra Runs			Average	1.50				Average		

Total		2.93	6.24	9.03		12.47				
Average		0.49	1.04	1.50		2.08				

Travel Time	0.49	0.55	0.46	0.58			
Length	0.10	0.05	0.05	0.20			
Speed	12.2	5.45	6.52	20.7			
Rate of Motion							
Standard Rate							
Delay Rate							
Volume							
Vehicle Delay Rate							